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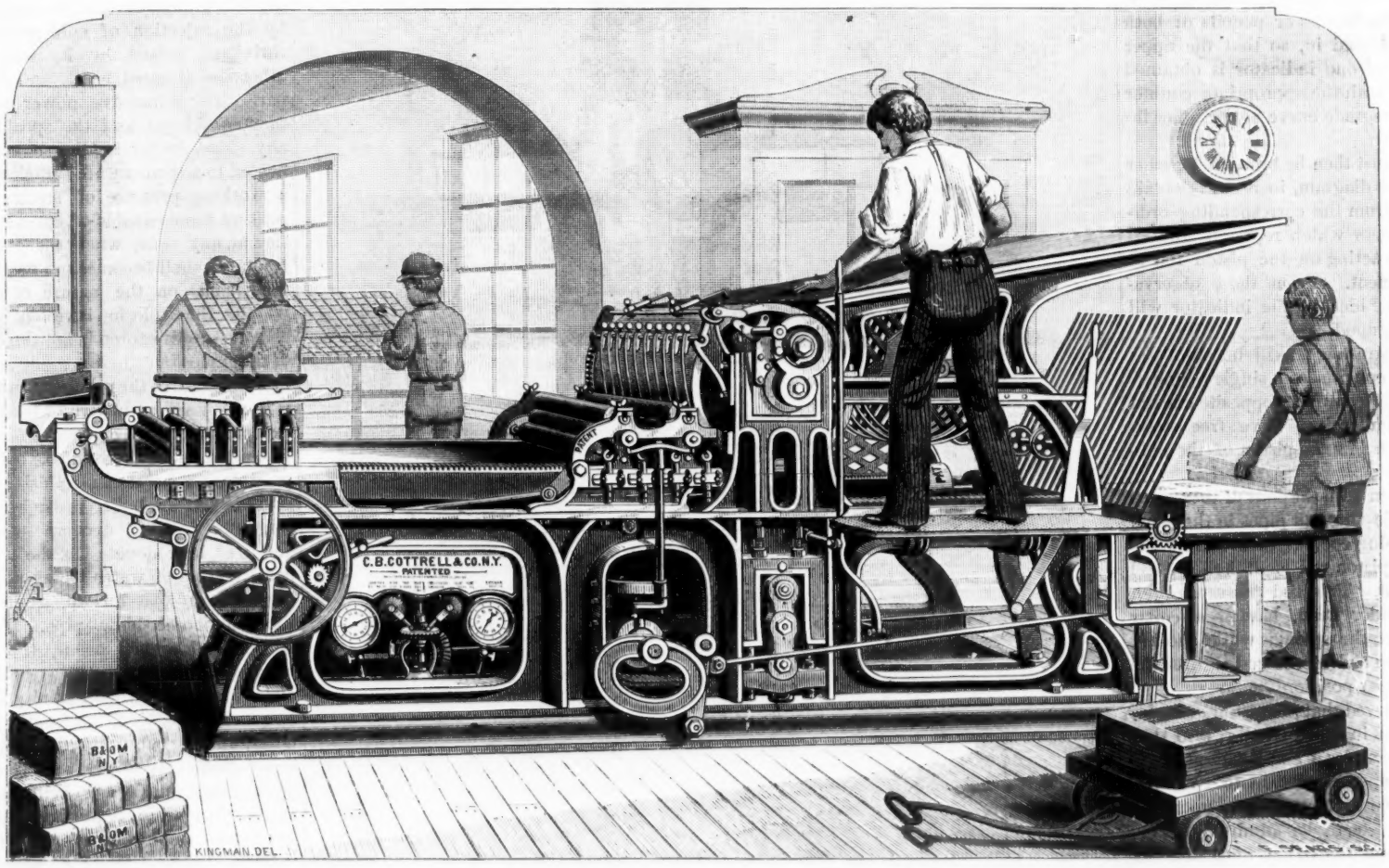
Improved Two-Revolution Printing Press.

The engraving herewith presented represents the latest improved two-revolution printing press, with four form rollers, as manufactured by C. B. Cottrell & Co., of No. 8 Spruce street, New York, and No. 112 Monroe street, Chicago, Ill.

This press is especially designed for rapid and accurate work, and is suited for the finest quality of illustrated and colored work, printing the largest forms of this class of work at a speed of from 1,800 to 2,000 per hour. As is well known, in this class of press the momentum of the bed increases rapidly with the increase in speed, so that at high speed, and with the weight of the full form, several thousand pounds are required to arrest the motion of the bed and to start it in the opposite direction. To accomplish this latter purpose, the more usual plan is to use steel springs, which in operation are neither theoretically nor practically correct. The proper tension of a spring to arrest the motion of a reciprocating body varies with the speed and weight of the body, and, in order to accomplish the purpose in a proper manner, the tension should be susceptible of easy adjustment, to meet the varying conditions of load and speed. This adjustment is not readily made, nor, indeed, cannot, generally speaking, oe satisfactorily made at all with a steel spring. Another unfavorable feature of the steel spring is that in making ready it offers an uncomfortable resistance to the necessary movement to and fro of the bed, thus hindering the pressman in his work, and requiring the performing of unnecessary labor. In the press here shown the duties of the steel spring are performed by an air spring or cushion, which obviates the difficulties previously referred to. It is plain that a simple air spring would be open to substantially the same objections as the steel spring; but in the one used with this press these objections are, by the combination of simple devices, overcome. As previously stated, the varying momentum of the bed requires a corresponding varied spring resistance. For this purpose, there are used in connection with the air spring a governor and vacuum valve, the whole acting in harmony to bring about the desired results.



IMPROVED TWO-REVOLUTION PRINTING PRESS.

The pistons, or plungers, of the air-spring cylinders are situated at the end of the frame, and in a position to be covered with the cylinders, which are connected with the bed, at a time in the reciprocation of the latter when it is nearing the end of the stroke. The plunger rod is hollow, and connected by a pipe extending along the frame to a valve operated by the governor. The governor, when the press is in motion, operates this valve to close the air passage, in proportion to the speed, and when the press is stopped, the dropping of the balls operates to fully open the passage, thus entirely relieving the spring and leaving, as previously stated, the bed free to be moved by hand. The plunger is fitted with spring packing, so as to allow the packing to expand to fill the cylinder. This feature also permits the packing to be compressed in case of the accidental interposition of any foreign substance. The vacuum valve is for the purpose of preventing the formation of a vacuum when the motion of the bed is moving the cylinder off the piston. If at this time a vacuum is allowed to form, it wastes power when the press is running, and is an inconvenience when moving the bed by hand.

The spring gauges, shown in the cut and near the governor, are for the purpose of indicating the pressure in the air cylinders. This pressure is regulated by moving the plungers backwards or forwards on the rods by which they are connected to the frame. Each press is furnished with a table of pressures suitable for the different speeds, so that it is only necessary to adjust the pistons till the gauges show the table pressure for the speed at which the press is running, to have the cushion right. The arrangement of air spring, etc., above described, is one of the features which permit this press to be run at a speed that could not be otherwise more than approximated.

A friction device is employed for so controlling the motion of the press cylinder as to leave it uninfluenced by the wear and natural back-lash of the gearing, by which means perfect register is secured at the highest speeds.

Another convenient feature of this press is the hinged roller frame. This frame is constructed in two separate parts, hinged together in such a way that a turn of a small hand-wheel uncovers the form rollers, leaving them free to be removed and replaced. This also leaves the vibrators in a position to be removed with equal readiness. Another turn of the hand-wheel replaces everything. This being all accomplished from one side of the press, and the rollers being left quite free to be handled, the work is done in a more satisfactory manner, and in only a fraction of the time usually required.

As will be inferred, the cylinder of this press revolves twice, during the first revolution, being raised entirely clear of the form. During the second revolution it is in contact with the form, and the impression is given.

The sheet delivery used with this press dispenses altogether with the use of tapes. This is a very satisfactory feature, especially from the pressman's point of view, the frequent breakage of tapes, which wind around the form rollers and destroy them, being a constant source of annoyance. Not infrequently the broken tapes, by lying over the forms, seriously injure them as the bed passes under the impression cylinder. This delivery is quickly and readily adjusted to any style of printed matter, and delivers it to the fly without danger of blemish.

A prominent feature of this press is its general strength and stability. This feature, together with the special features noted, and others not mentioned, and by which the various motions are automatically controlled to suit the varying conditions of the work, adapt it for doing the class of work usually done on such presses at a speed limited only by the capacity of the feeder. In the construction and in the general arrangement of its parts especial reference is had to cleanliness, or to the exclusion of any foreign matter, which is, of course, particularly essential for doing first-class fine work.

Prussmann's Steam-Engine Indicator.

The design of the indicator herewith represented is based upon the assumption that the indicators in use do not give a direct illustration of the total pressure resulting from the pressure in front and behind the steam pistons, and acting upon the piston rod, but are simply an illustration of the pressure existing in one and the same end of the working cylinder during one revolution of the engine.

The upper portion of the diagram—that is, the steam and expansion line—does not really belong to the retrograde line marked beneath it, but to a retrograde line which would be formed, if at the same time an indication of the other end of the steam cylinder should be taken. If, notwithstanding this fact in the present practice, in such a diagram, the retrograde line of the same cylinder end were represented in a reverse position, it is assumed that the engine works with a uniform pressure on both cylinder ends during two successive revolutions. If, as is frequently done, the indicator is brought successively in communication with both cylinder ends by means of a three-way cock, it is assumed that the pressure in the steam cylinder remains uniform during several successive revolutions. All these assumptions can lead, according to circumstances, to mistakes, which can only be avoided by the use of two indicators—one on each end of the steam cylinder. Great care must be observed if at the same time the tracers or pencils of both indicators are forced in, so that the upper diagram curve of one indicator is obtained simultaneously with the appropriate counter pressure or retrograde curve of the other indicator.

These lines must then be brought together by hand in one diagram, in order to obtain by subtraction from the corresponding ordinates the distances which represent the effective pressure acting on the piston rod at any given moment. From these observations, the leading idea in the indicator will be readily understood.

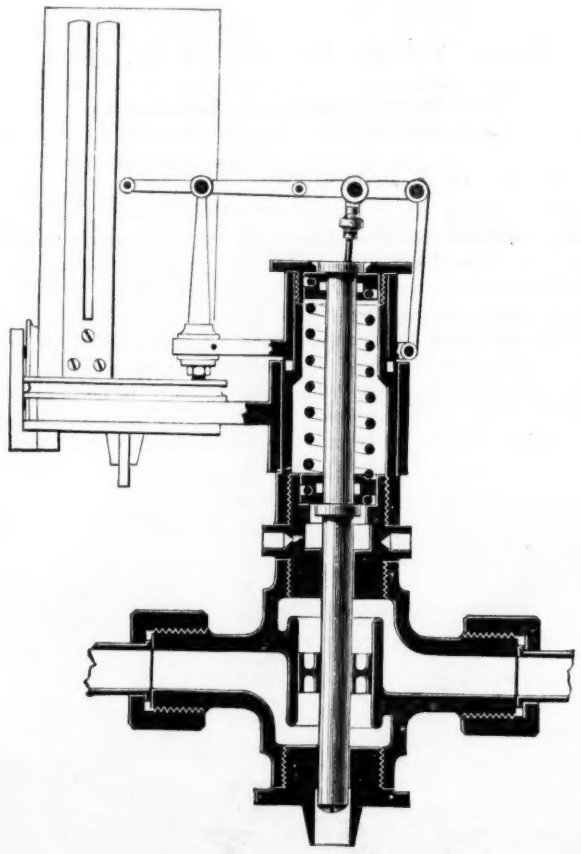
From the illustration, it will be seen that this instrument consists of a single cylinder, so formed that steam from opposite ends of the engine cylinder can have free access both above and below the piston of the indicator.

Communication with the ends of the engine cylinder is made through pipes in the usual way, having a plug cock at each end of the cylinder. The piston rod is of hollow steel to make it light. This rod passes through the upper cylinder head, having a collar above to support the spring, while another collar at the top end of the rod secures the spring in its proper position.

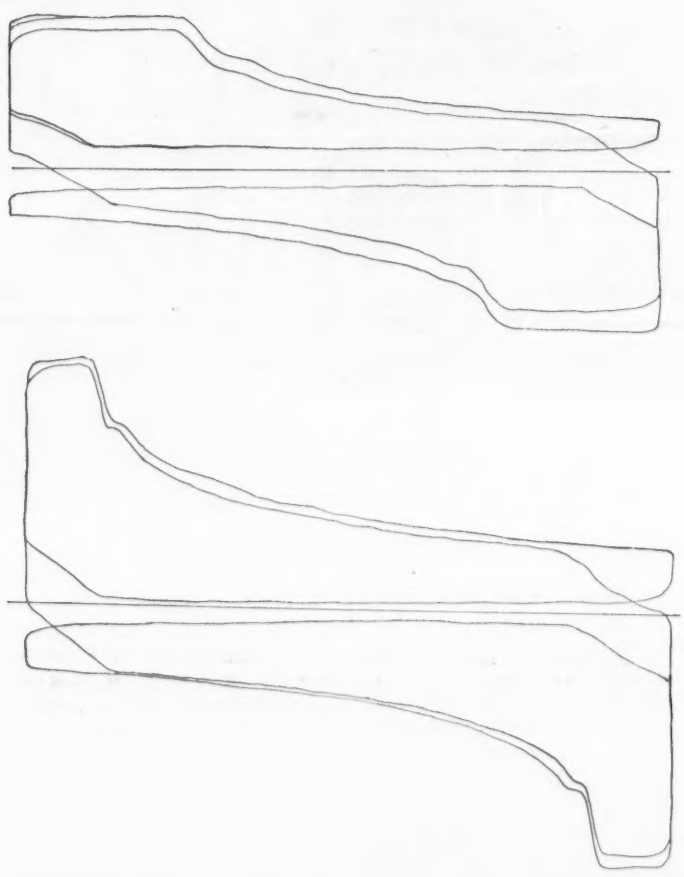
It will be observed that the piston occupies a central position in the cylinder; also that the pencil bar occupies a similar position in relation to the paper drum. In this position there is no tension or compression upon the spring, and, if steam be admitted to the right-hand passage, it will act upon the top of the piston, pressing it down; then, if this pressure be removed, the piston will return to its original position. If a corresponding pressure be admitted to the left-hand passage, it will act upon the bottom of the piston, pressing it upward. The spring being loose upon the piston rod, the strains are met by the collars previously mentioned, and the pencil is free to move equal distances above and below the atmospheric line, or line of no pressure, shown between the diagrams.

The springs are readily changed by unscrewing the upper part of the piston rod, then removing the cylinder head and spring. When the cocks are closed the piston remains in the position shown, but let the cocks be opened, and one side of the piston is exposed to a pressure equal to the difference between the pressures in front and in the rear of the engine piston as the same travels in one direction On the return stroke of the engine piston the opposite side of the piston is subjected to a corresponding pressure as in the previous stroke. The diagram thus obtained, therefore, is a line which is situated partly above and partly beneath the atmospheric line and the deviation from the atmospheric line on either line gives correctly the effect upon the piston. The two annexed diagrams were taken with this indicator.

The curve above the atmospheric line indicates the work of one, and the curve below the atmospheric line the work of the other end of the engine cylinder. The entire closed curve gives the work during one revolution. By closing either one of the cocks separate diagrams may be taken from either end of the cylinder, as now practiced with ordinary indicators. If the separate diagrams of both cylinder ends and also the combined diagram are marked on the same strip of paper, a clear illustration is obtained which greatly facilitates the calculation.



NEW STEAM ENGINE INDICATOR.



This indicator is also claimed to have the following advantages: To be entirely unaffected by the variations of the atmospheric pressure or of the barometer. While in other indicators the indicator piston is exposed at one side to the atmospheric pressure, the effect of the atmospheric pressure upon both sides of the piston of this indicator is equal. Considering the fact that indicator springs can only be adjusted correctly for a certain fixed atmospheric pressure, and that the atmospheric pressure varies constantly, and particularly that the variations in the atmospheric pressure are very great when an indicator is used on a locomotive traveling over mountains, or on an engine situated in a mine, it is claimed that this indicator will give more reliable indications by eliminating the greater part of these difficulties. This indicator is made under the Thompson patents by Schaffer & Budenberg at Buckau, Germany, and at present cannot be sold in this country without infringement. Arrangements, however, will probably be made by which it may be obtained.

Steam Boiler Explosions.

We take from the *Providence Journal* the following report of a lecture on boiler explosions, delivered before the Rhode Island Engineers' Association at their recent meeting in Providence:

"Mr. Brayton began by referring to the vast destruction of life and property that has been occasioned by the explosion of steam boilers, and said that when we note the wonderful improvements being made in other branches of industry, and at the same time witness these frequent explosions, it would seem that science was neglectful of a very great object. Unfortunately the present system of steam boiler construction with its interests and teachings is somewhat opposed to any radical change or improvement. The best riveted boilers are not proof against the weakening influences of corrosion, crystalization and unequal expansion, so that it is only a question of time when any shell boiler, no matter how well made or attended, will have to yield. It may cause little damage or it may prove a great calamity. When a boiler has a rising head of steam the furnace doors are often thrown open, and wet coal thrown on the fire, while a strong draft of cold air rushes in between it and the boiler, and if this does not lessen the pressure the force pump is set to work injecting comparatively cold water. This produces an immense strain and damages the boiler more, perhaps, than holding the required pressure for a year. After further illustrating this point he gave a practical test of his proposition that if heat be applied to the bottom of a vessel of water its contents will be heated alike, but if applied at or near the top it will boil there, while an inch or two below it will remain cold, and that if the boiler iron be flexible enough to stand the strain occasioned by the injection of cold water, and the shrinkage caused by it, well and good, otherwise it must break and tear in some part. The expansive power of steam was then considered, and the speaker said that any steam boiler holding a body of water heated to a temperature sufficient to produce a working pressure of steam, contains a pent up force capable of spreading devastation at any time, when the overworked or fractured shell becomes too weak to hold it. It depends on the nature of the rupture, whether the explosion is violent or otherwise. The destructive force is not the direct cause of the explosion. There is no element, or condition exercised in the production of steam, that is in any way productive of force or danger, except through the expansive force of heated water and the weakness of the boiler. It is impossible to generate an explosive mixture of gases in a steam boiler with a head of steam, for water does not decompose through the action of heat alone. On the contrary, the constituents of water combine under the most intense heat known, as illustrated by the compound blow pipe. If, however, decomposition does occur, the plate must have been highly heated in some part, and owing to the powerful affinity between the iron and the oxygen, the former absorbs the latter, and in that proportion the hydrogen is set free. Hydrogen and steam cannot ignite, and the former being many times lighter than steam, is the first to escape from the boiler. Continuing, Mr. Brayton said that the primary cause of all boiler explosions is the insufficiency of strength in the boiler to hold a steady pressure of steam, but the species of fracture that lead to them are numberless. The weakening process is so gradual and unobservable that the crash comes when least expected, and no amount of watchfulness can foretell the event or when it will occur.

"The declaration is often made that steady pressure of steam never blew up a boiler. 'Just keep plenty of water in your boiler, and there is no danger,' is also a remark often heard. This, said the speaker, is a fatal mistake, and one of the worst that can be made, and the engineer who believes it is more or less indifferent to all other conditions. If there is no water in the boiler, it cannot explode, and the greater quantity of water the more terrific will be the explosion. To illustrate this, take a piece of steam pipe 3 inches in diameter and 3 feet in length, screw a steam-tight cap on one end, then procure a pitch-pine plug about a foot in length and a little larger than the bore of the pipe. Fill the pipe with water to within eight inches of the top, and drive in the plug to within two inches of the surface of the water; this allows the water to expand as a

liquid, and not quite fill the pipe. Place the pipe horizontally in a fire so as to be completely enveloped in flame, and within eight minutes there will be a violent explosion. Now it cannot be said that low water caused this explosion, because the boiler was full, and there could have been no red-hot sheet, and consequently no gas could be formed by decomposition; there was no whistle or safety valve to open and cause agitation; no force pump to inject cold water on a hot sheet—nothing, in fact, save that the steady pressure of steam had found the weakest point. The speaker, however, did not wish to be understood as advocating low water, as that would cause extreme inequality of expansion.

The speaker closed by asking the inventive genius of the world to devote itself to the production of a steam-producing apparatus which will fulfil all the requirements, and have sufficient strength, under all circumstances and conditions, to hold a steady pressure of steam.

Saunders' Pipe Threading and Cutting-off Machine.

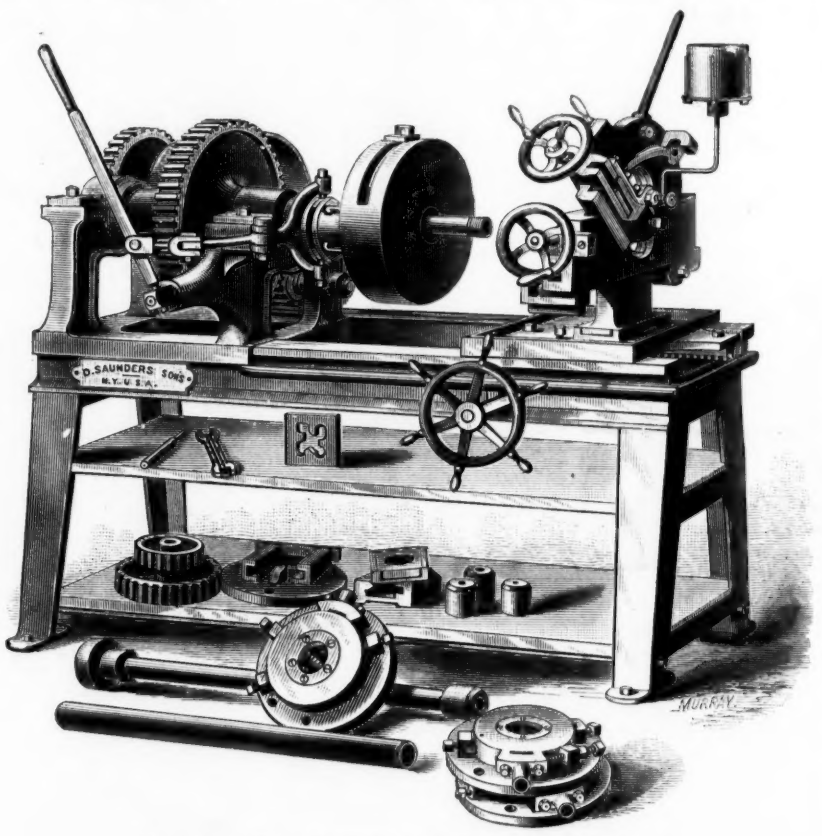
In the American Machinist of May 22, 1880, we illustrated and described a machine made by D. Saunders' Sons, of Yonkers, N. Y., for threading and cutting to any length. gas-pipe ¼″ to 2″ inclusive. Although the machine as there shown was very effective for the purposes named, in order to further increase its utility, and particularly to adapt it to still more rapid changes from one size of pipe to another—a matter of great importance where, as is generally the case, such changes are of frequent occurrence—several important changes have been made in the machine as there illustrated, to which attention is called through the accompanying engraving, representing the machine as now constructed by the same firm.

One of these improvements is in the chuck. As described in our issue referred to, the jaws by which the pipe was held for being operated upon were independently adjusted to the different sizes of pipe. In the present construction the adjustment to size is made by means of a scroll, which simultaneously moves all the jaws. This is done by loosening the set bolt shown in the engraving at the top of the chuck, when, by inserting a pin in a hole at the bottom of the slot shown in front and below the bolt referred to, the jaws are brought concentrically into contact with the pipe; then, by tightening the bolt, the chuck is ready for the particular size of pipe required. This makes the adjustment from and to any sizes, the work of but a moment, and, as compared with the separate adjustment of the jaws, instantaneous. It will be understood that this adjustment does not refer to griping the pipe for holding it while being cut, etc., but simply to the making ready for the cutting of any number of pieces of the same size. The griping is done by a simple movement of the lever, shown at the left side of the engraving. This lever moves a sleeve on the spindle, which by suitable mechanism moves the binding jaws to hold or release the pipe. For this purpose it is not necessary to stop the machine, the pipe being inserted and removed with the machine in motion.

Another improvement is in the substituting of forked jaws for bushings or sleeves, to center and steady the pipe in cutting off. With the bushings as formerly used, it was necessary to provide one for each size of pipe, while with the present device one set of jaws answers for all sizes. These jaws are operated by a right and left-hand screw, by which means they are instantly and concentrically brought into contact with the pipe, whatever its size. This obviates the trouble of a poor or shaky fit, so troublesome in cutting off pipe, which results from the unavoidable wear of the bushings, as well as from the necessity of originally making them large enough to allow for the usual variation in the size of pipe. The cutting-off tool is carried by the slide, operated by the upper of the two hand-wheels shown at the right-hand side of the engraving. The hand-wheel immediately below this operates the jaws for centering and steadying the pipe.

In the general arrangement of the machine the most noticeable feature in the way of improvement is in moving the gearing to the back side of the machine, where it is obviously more out of the way than when at the front. Other minor improvements consist in the arrangement of some of the parts to facilitate the various operations.

The dies used with this machine are adjustable-expanding, being brought up to cutting position by a slight motion of a lever, and as instantly released to allow of the removal of the pipe without running back over the thread. Solid dies may, however, be used when desired.



Improved Pipe Cutting and Threading Machine.

Boiler Makers and Boiler Users.

By Frank Gleason.

If in mechanical matters a man attempts to account for all things being as they are, the chances are that he won't need any other job to fill up his time. There are different ways of accounting for the same thing, and unfortunately it is generally easier to reason from an outside view, and to set false cause and real effect against each other than it is to get under the surface and offset real cause and effect.

There isn't a more satisfactorily abused class in the list of mechanics than boiler-makers. It seems to be a satisfaction, sometimes, to abuse things and individuals on universal principles, and there are a good many that enjoy that satisfaction at the expense of those who are so unfortunate as to make and repair—especially repair—boilers. When the occasion for abusing a special class of community exists, it may be the best thing to see that they get what abuse they are honestly entitled to. But it is a fair question how much of the abuse that a boiler-maker has to carry comes from an honest consideration of all the circumstances of the case, and how much from a consideration of final results, without the trouble of getting back towards the cause at all.

Some one says a boiler-maker, from the responsible nature of his work, ought to do more thinking than any other mechanic, but that he don't do any to speak of. If the party who made the remark to this effect could only be convinced that a boiler-maker is forced, by the logic of circumstances, to think more about what not to do than most mechanics are required to think about what to do, he might be induced to modify his expression, and possibly his opinion.

When you mix a boiler-maker up with marking, and shearing, and punching, and riveting, to the extent of making the performance of these operations *in some way* the ultimate end of his aspirations, it is simply an attempt to get him below the level of his trade. When you mix him up with these things in such a way as to confine him to the poorer and cheaper ways, you take away the best part of him as a mechanic, and compel him to think too much in the direction of these poorer and cheaper ways. No man knows better than he that the ability to get along with the mechanical details of his business is infinitely less than the end that ought to be gained by their means, but it is questionable if any other mechanic has less to do with setting up that end and then working for it than he. A boiler-maker has to carry off more of the shortcomings of others than any mechanic has a decent right to be encumbered with.

When a machinist does a poor job, the probability of a failure in its future operations is always impending. Some day its present usefulness will depart, from the effect of the failure of the slighted part. The consequences may be far-reaching enough to suspend the operations of some establishment for a day or two. This means a pecuniary loss; but the point isn't the stopping, and the resulting loss in dollars and cents, but the *probability* of its occurrence.

When a boiler-maker does an equally poor job, the possibility of disaster is in the future. The point isn't the disaster, but the *possibility* of its occurrence. The probability of pecuniary loss has a good deal to do with the character of the work demanded of the machinist. It is allowed to work its legitimate purpose in the direction of thought towards improving his products, with the certainty of reward following success. The possibility of disaster can't be worked in to the same purpose. There is too much difference between an impendent probability and a remote possibility. This difference governs the character of the demand made upon the skill of the boiler-maker. It stimulates thought in the direction of low price, and works out its perfect end of poor work.

I don't propose to offer apologies for poor work, but philosophy teaches us to look for a reason for everything. When you look for the reason for a good deal of poor boiler work, it will be essential to success to look beyond the boiler-maker. The possibility of the future may affect all parties, but it won't be found to influence the user less than the maker of boilers.

There is a good deal more in this matter of demand in things mechanical than is always thought of. When a demand is made of the mechanical part of society, that demand is usually honored. The quality of the product may be depended upon to illustrate the character of the demand. When the unfortunate proprietor of a boiler shop proposes to stop the work in some establishment for six days to repair the boilers at an expense of 400 dollars, he isn't listened to; not as against the party who does the job for 200 dollars and stops the works two days. There is too much difference between 400 dollars and six days, and 200 dollars and two days.

The objective point in boiler repairs is to get to running in the shortest possible time, and at the least possible expense. Boilers are occasionally repaired on some other basis than this, but not often enough to speak about. The demand is for short time and short pay, and the man who figures to that purpose meets the demand and gets the job. If the ultimate end of the poor job is disaster, he gets the benefit of a free and extended advertisement. No one thinks of going behind the fact for the cause.

So long as the proprietor meets the demand as it is, he has the possibility of keeping his business going. If he stands on what he *knows*, and makes the demand himself, he won't find much difficulty in shutting up shop and retiring on what he hasn't made at the business.

Probably it is too much to say that a boiler-maker—or repairer—is excusable for meeting the demand as it exists, when that demand is for something that imperils the lives of his neighbors. It wouldn't, perhaps, be putting it on too high a plane of morality to say that he wasn't excusable. There are, however, in his case extenuating circumstances. Experience teaches that it isn't wise to put morality and failure against pecuniary success, and trust to the inborn goodness of even a boiler-maker to resist the temptation to lean towards the best side, financially. It isn't a difficult operation to reason up to the fact that so long as prospective owners are looking for cheap boilers, and present owners are interested in cheaper repairs, some one will be found ready to balance the conditions of demand and supply. When it is made reasonably clear to a man that if he don't get a desired thing another will, that fact is made an apology for considerable moral angularity in the way of stretching out towards the coveted end.

After all, the best way to remedy an evil is to commence at the beginning. It is the only way to remedy some evils. I don't mean to say that all boiler users are looking to the sole end of cheap work, but a controlling number of them don't look much beyond that point. The limited few that do look further have no serious trouble in getting the quality of work they are willing to pay for, and complaints against boiler makers from those who look further are not numerous nor grievous. Their demand for good work is honored, just the same as the demand for poor work is honored. The obvious moral is, if good work is ordered and paid for, it will be furnished.

You can't coerce a boiler-maker into doing good work on short time, and for short pay, and it wouldn't be right to so coerce him if it were possible. Perhaps it isn't possible to coerce boiler users into demanding good work for good pay, but it is the point where reformation ought to begin. You can't expect the boiler-maker to make the demand and fill it besides; especially when the collapse of his business as a consequence is imminent, or certain.

The policy of letting up on the boiler-maker and laboring with the boiler user, is worth considering. I don't mean laboring with him in the way of using his boilers, but in contracting for them and in repairing them. Not that the using of them hasn't a good deal to do with final results, but that it belongs to another branch of the subject. When a man wants anything of a particular quality, he usually finds the best way to get it is to call for it. If he calls for the best quality, he expects to pay the best price. If he calls for the lowest price, he expects the poorest quality. It don't make any material difference whether the thing called for is a jack-knife or a steam boiler.

Shop Kinks.

No. 37.

BY LEWIS F. LYNE.

WRINKLES IN LATHE CENTERS AND CENTER REAMERS.

After all that has been written upon the subject of centering and turning work in lathes, there is still much to learn. Substantial progress is often hindered and sometimes prevented by some peculiar notion that may exist in the fossil-like mind of a proprietor or superintendent.

As I have not discussed the subject of centering work in lathes in any of my SHOP KINKS, I am persuaded that a little ventilation of that essential branch of mechanical manipulation may prove of interest and permanent value to that class of workmen who have not thought much in this direction. If there is any one thing used in connection with lathes that remains as a relic of barbarism it is the old-fashioned square center as shown in Fig. 1 of the accompanying cuts. This cut represents a side and end view of a *thing* erroneously named in the category of tools, which will not cut, but tears its way into the end of a piece of work. Being in most instances made of inferior steel on account of the large quantity of material required to make it, this square center is easily and quickly dulled.

When first made, this center is usually filed to a gauge, which corresponds to the other centers of the lathe, so that the hole made with the square center will fit the other centers. When dulled, the workman takes this square center to a grindstone and begins to grind it to the same angle as it formerly had. This is when his patience is undisturbed, but after grinding for awhile he gets irritable, and in consequence the tapered end of the square center begins to rise and the sharp edges to appear. The center gauge in his pocket is forgotten, and the edges upon the square center assume the form shown by the dotted lines *a*, *b*, in Fig. 1.

When the work, after being square centered with such a tool, is placed upon the center of the lathe, the fit is like the example shown in Fig. 4, where it will be seen that the bearing is nearest the point of the center, which is not as it should be. Some mechanics advocate the opposite extreme and make the angles of the square center less acute than the other centers, so that when a piece of work is centered with it and placed upon the centers, the fit will appear like the illustration Fig. 5.

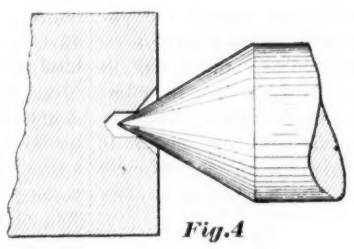


Fig. 4

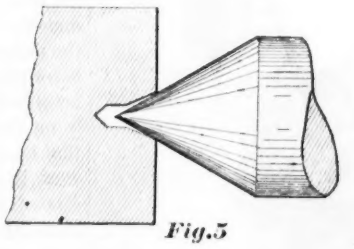


Fig. 5

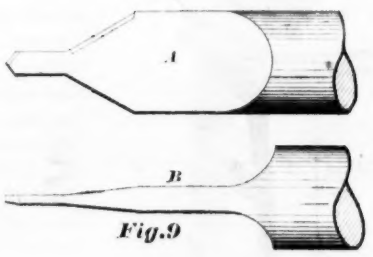


Fig. 9

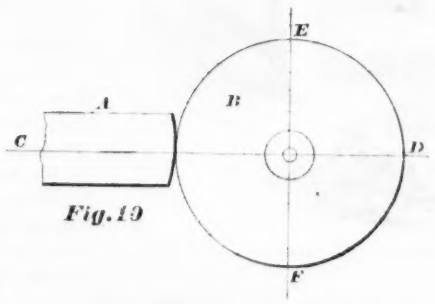


Fig. 10

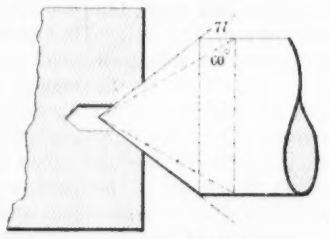


Fig. 7

In this instance it will be observed that there is only a narrow bearing upon the center at the end of the piece of work. Some workmen will lift their voices in high and mighty argument, contending that the plan followed in Fig. 4 is the better, because it will lubricate more speedily and is less liable to wear out of true upon the center than that shown in Fig. 5. Others may be found whose opinions upon mechanical matters are equally good, who will use the same arguments in favor of the latter. I must say that my experience has taught me that both are wrong, and as a proof I will call upon the dead center to testify. It is here shown in Fig. 8. This portrait was taken from life, being a truthful picture of a center used by a workman who advocated the use of the plan shown in Fig. 5. Much of the work done in his lathe was upon steel, such as taps, reamers and other tool work, very little care being taken in annealing the steel before centering.

It will be understood without any description how this center could have been so badly "chawed" as the shopmen say, by the improper bearing of the work upon it. If the principles illustrated in Figs. 4 and 5 were carried out in making pillow blocks, and the various bearings upon steam engines and other machinery of the present day, we would very soon hear of a variety of accidents and casualties.

If I were to order a set of hardened steel mandrels to fit the U. S. Standard 60° lathe center gauge, and they should come to me with centers like either Fig. 4 or Fig. 5, I would send them back at once with an inquiry as to why my order was not executed according to directions.

If mandrels are to remain true without damaging the lathe centers, they must fit the centers upon which they are to run, and they must fit with as great accuracy as any other bearing about machinery. Such a fit is shown in Fig. 7.

I have found in practice in railroad and general repair shops that the U. S. Standard center of 60° is not generally used, being considered too sharp. In turning taper work in lathes not having a special taper attachment, these centers are more quickly destroyed in consequence of their sharpness or the acuteness of their angles. On heavy work the points are more easily bent or broken than if the angles were less acute.

I one tried centers of different angles upon several lathes to see which would last the longest upon general work, and finally adopted an angle of 77°, as one that did the best service.

Accordingly I had all the lathe centers in the shop made to one gauge, 77°, and all center reamers and square centers made to the same gauge, after which I had little trouble with "chawed" centers.

The square centers I used, however, were not like the one shown in Fig. 1, but were cut out upon a milling machine, as shown in Fig. 2.

Some workmen advocate fluting square centers with a round-faced cutter, to reduce the grinding surface. It accomplishes this object, but fluting does not help the cutting qualities of the edges nearest the point. Neither does fluting help the oil to get in, or the chips to get away from the point where they do the most damage. Since the chips cannot get out nor the oil get in, the "chawing" process goes on uninterruptedly. By cutting out a square center as shown in Fig. 2, it will be seen from the end view that space is allowed for the chips to work out and for oil to be freely applied; but such a tool cannot cut—it can only scrape or tear off the metal. This style of square center was finally abandoned for the one shown in Fig. 3, without the drill for general work I wish to say at once that it will not do to make this tool of poor steel. It must be made of the best, otherwise the center shown in Fig. 2 would better be used.

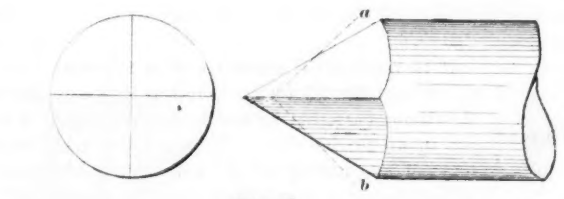


Fig. 1

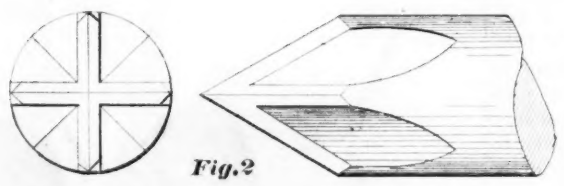


Fig. 2

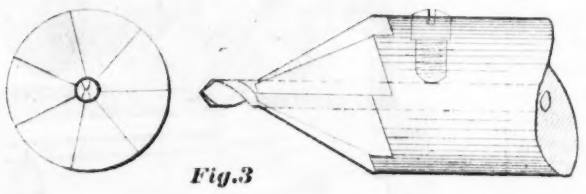


Fig. 3

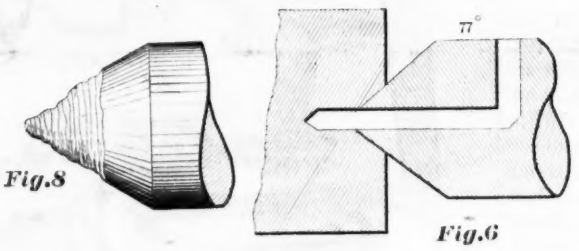


Fig. 8

Fig. 6

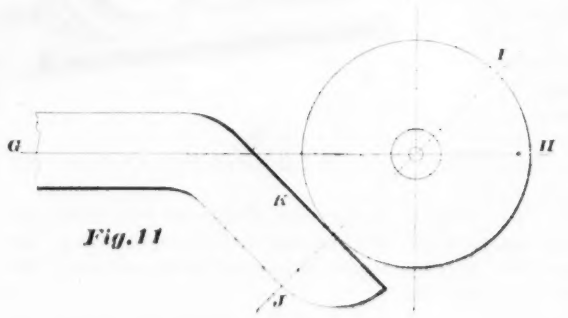


Fig. 11

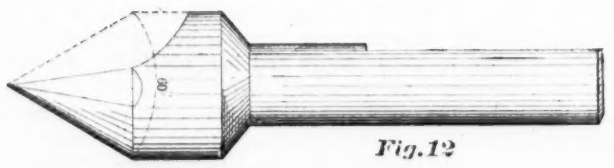


Fig. 12

It will be seen that the tool shown in Fig. 3 has seven cutting edges, which number has been found to work well in practice, as they cut freely, but not too much so. A hole was made through the center of Fig. 3, to admit a twist drill of a proper diameter to suit the class of work to be done. The twist drill was held by a small screw, as shown. This tool drills and reams the center at one operation. To use this tool the work has to be held in a steady rest, or otherwise supported, and it cannot be made to answer the same requirements as this style without the drill, or even that shown in Fig. 2.

A more simple (probably the simplest) form of a tool to accomplish the same purpose, is shown in Fig. 9. It consists simply of a round piece of steel, either milled or filed in the way to make a drill having two diameters, as shown at *A*, while *B* shows an edge view of the same tool. This tool is of more value upon brass work than upon iron or steel, being very useful in centering pieces of brass work held in a chuck. There is difficulty in using this upon wrought iron and steel, for the reason that the small drill is liable to clog up and twist off. Iron and steel are difficult to cut, hence they require a tool to be more frequently ground than brass. To give the chips room to escape requires the small or drill part to be made light at the point of the countersink.

The center reamer shown in Fig. 12 is an excellent tool, the advantages of which were ably set forth by George B. Foote, in the AMERICAN MACHINIST of March 18, 1882. There is one additional point, however, that may be mentioned in favor of this excellent tool. It is this: Cutting off one side less than half the diameter as shown in this illustration, and leaving the cutting edge at an angle and not parallel with the center line insure a smooth true center. For this reason it may be used with safety in centering heavy work, whereas, if precisely half the diameter were cut away leaving the cutting edge on a line and parallel with the center, it would be a great deal more liable to chatter upon heavy work.

Such a reamer as the one last mentioned works satisfactorily upon light or special work; the same is true of the standard center of 60°. The reamer here shown when made of the best steel will last for a long time, and when worn out may be thrown away without sustaining any net loss.

For lubricating the centers of all lathes above 16" swing, I have found the wrinkle shown in Fig. 6 to work well. In turning off a pair of driving wheels and other heavy work, I have been at times very much annoyed by the center becoming dry, so that the lathe had to be stopped and the center slacked off for oiling.

These difficulties may be successfully met by drilling the dead center, as shown, so as to form an oil hole reaching to the point of the center from which oil may be freely supplied to the bearing surfaces.

In the old and barbarous way of square centering a shaft in a lathe, the butt end of a tool shown at *A*, in Fig. 10, was placed in the tool post and pressed against the shaft *B*, at the same time the square center was forced in. The pressure of the tool being on a line with *C D*, and at right angles to *E F*, the back of the carriage was lifted slightly as the rough, uneven surface of the shaft came in contact with the butt of the tool *A*.

Under such circumstances, the writer has known a workman to waste his time for hours in trying to get a large shaft to run true without success.

To accurately center a piece of work in a lathe, the rest pressing against the work must be as firm as possible, and the spindle holding the dead center should project beyond the tail-stock as little as can be allowed, to insure greater stiffness. Another and most essential point to be observed is to apply the pressure to the work at an angle of about 45°, or in direction of the line *I*, *J*, in Fig. 11, *G*, *H* representing the horizontal line

from which the angle is to be taken. It will be perceived from the illustration that the revolving shaft cannot by any possible means lift the carriage, but will rather press it firmly upon the shears. In many lathes built at the present time the front of the carriage overhangs to such an extent that, together with overhanging of the weight upon the apron, there is a force sufficient to lift the back part of the carriage from the shears. In almost all lathes a pressure applied, as in Fig. 10, would cause the carriage to be lifted at the back.

In taking a finishing cut with water and a broad nose tool, the writer noticed upon a certain lathe that the tool would cut very nicely for a short distance, then suddenly dig into the shaft that was being turned. An examination revealed the fact that the pressure upon the tool tipped the carriage, so that the back part, instead of resting upon the shears, bore hard upon the gib on the under side of the shears. When the tool reached a soft spot in the iron, the back of the carriage would drop and cause the tool to dig in. Upon such a lathe as the one described, the tool should be set so that the cutting edge will not be above the center.

It may be found necessary to place additional weight upon the back part of the carriage to keep it down firmly in doing certain kinds of work. In well regulated shops all work to be turned is made as straight as possible by the eye of the blacksmith, so that it is entirely safe to drill and ream the centers; then what little straightening may be found necessary should be done before squaring up the ends.

Much stress is put by some workmen upon the impropriety of drilling and reaming the centers in work as it comes from the blacksmith's shop; but I am persuaded that such apprehensions have no special relation to the true cause of the difficulties experienced. The material should be made as straight as possible before it is placed in the lathe; then there will be no trouble; but if material is taken promiscuously from the blacksmith's shop, drilled and centered, I can then readily understand why trouble could occur.

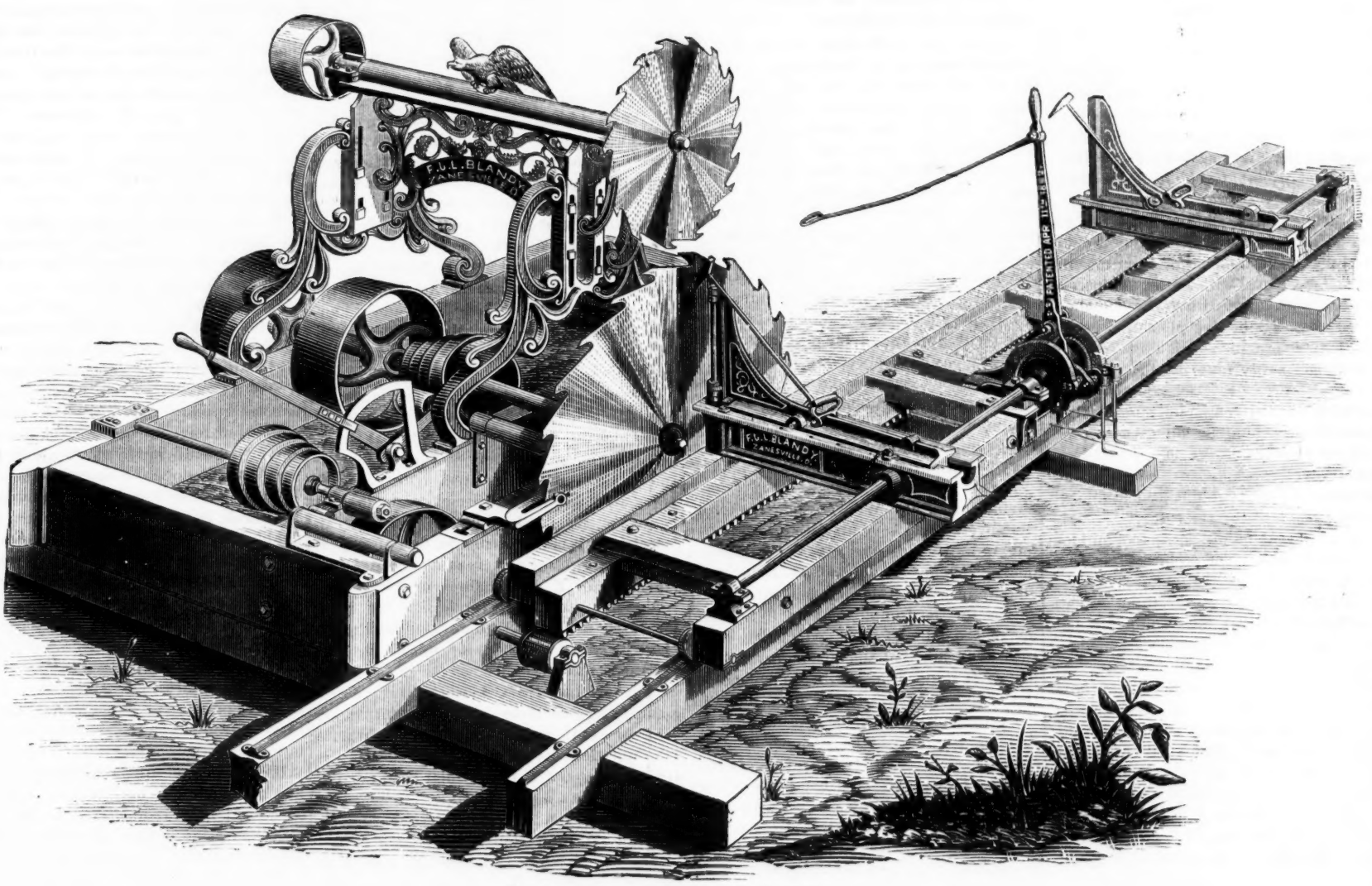
All shops should have a centering machine, which they can either buy or make at a nominal cost, but one should be obtained somehow. Such a machine can be purchased having a centering chuck and a drilling device, which would very soon pay for itself and a profit beside.

Centering rough work in a lathe should never be done when it can possibly be avoided. All material should be annealed and made fit for working, otherwise the cutting tools will be quickly destroyed by the hard scales upon the surface. Unless these scales are removed, standard gauges and tools are of little consequence.

Improved Double Circular Saw-Mill.

The double circular saw-mill here represented carries two saw mandrels, one placed above the other, as shown in the engraving. The saw collars are forged solid upon these mandrels, and after being turned, the mandrels are finished upon their bearings to insure perfect accuracy. The collars upon the mandrels are recessed, to cover the ends of the boxes, thus preventing the leakage of oil or the admission of grit and dirt. The boxes are self-adjusting, being pivoted in such a way that a perfect alignment is always insured. The upper mill being made entirely of iron is detachable, and can at any time be attached to a single mill. The mandrel passes through a single casting with journal boxes at each end. The box at the saw end is pivoted to the frame, while the box at the other end, having a lateral movement, is controlled by a screw. This arrangement allows the lead of the saw to be changed, which insures perfect alignment in the two saws. The pulleys are turned both inside and out, thus securing a perfect balance of rotating parts when running at high speeds. The carriage being shod with iron prevents excessive wear and facilitates the shifting of head-blocks.

Ways are of heavy wood, being heavily ironed both sides. The feed of the carriage consists of a small friction paper-wheel in contact with the face of a turned iron pulley. These pulleys are on independent feed shafts, and not on either of the saw arbors. The direction of the feed is controlled by one lever, and may be made to move the carriage either forward or backward, or it may remain at rest wherever desired. The feed may be varied by shifting a belt upon cone pulleys having four steps each. The axles of the carriage are of wrought iron, the length of which is the full width of carriage. The axles are fastened in the wheels, and have turned journals running in babbitted cast-iron boxes. The large wheels at each end of these shafts have turned faces. The iron rack has large teeth and is of unusual strength. Set works are composed of simultaneous detachable lever head blocks, with pawl lifters. It is well understood that upon the efficient operation of this mechanism depends the evenness and smoothness of the work produced. By using a device known as a pawl lifter, one lever only is used, where as by some other systems more levers, with extra attachments, are used. By the use of one lever the sawyer can, without moving from his position, engage or disengage the pawls controlling the movements of one or both head-blocks, as may be desired. The teeth of the ratchets and gear wheels, as well as the rack of the head-block knees, are all cut in machines for that purpose. With cut gears and proper graduations, the thickness of lumber can be accurately regulated. The log can be moved distances varying from one-eighth of an inch to three inches, as required, by one throw of the lever.



Improved Double Circular Saw-Mill.

These saw-mills are made by F. J. L. Blandy, Zanesville, O.

LETTERS FROM PRACTICAL MEN.

Eccentric Gears—Shrink Fits.

Editor American Machinist:

The inquiry of your correspondent "A. A. W." for a "rule" for shrink fits, and the very satisfactory reply thereto, impel me to offer a word or two in the same line. I fear I am a little too apt to smile when some one asks for a rule by which to perform one of the nicer operations of the trade. Let me say it another way. I lately wanted a pair of eccentric gears, about 2½″ diameter and ½″ thick, and of but a modest eccentricity. I applied to the firm which has the best facilities in the country for producing gears to make them for me. They replied, substantially, "It is difficult to produce eccentric gears in a style creditable to us and at a price satisfactory to the purchaser. We will make the gears you want for $22, but cannot promise a very nice job, and would rather not undertake it." Now, that was a thoroughly honest and respectable expression of the difficulty of making eccentric gears, and yet I doubt not there are hundreds of apprentices in the trade, of all ages from sixteen to sixty, who would, if they found occasion, ask with an implicit and child like trust for a "rule" for eccentric gears. Mr. Editor and gentlemen, correspondents of the American Machinist, by the way, what is your rule for making eccentric gears?

As to shrink fits, I confess I have a great affection for them. I wonder that so simple, cheap, and reliable an expedient is not more frequently employed. There is no reason why any machinist of average skill should be afraid of them. It is not bad luck, but ignorance or carelessness which encounters disaster. The most common error, I think, is in making too tight a fit. A little tighter than a good driving fit is tight enough for a shrink fit, and for general practice, on diameters not exceeding two or three inches, this is a safer way to state it than to state it by figures. An important point to be observed is the heating of the piece uniformly. This can be done much better, and safer, by building a fire around it than by heating over the blacksmith's fire. If the piece is not heated uniformly the hole will not be round, and if it is heated more around the hole than at the outside, the hole will not enlarge as it should, and there will also be danger of cracking the piece by the strain on the outside. If we lay a piece on the forge, and heat the eye only by a fire up through it, and if the outside is strong enough to stand the strain, the expansion of the metal would seem to promise to make the hole smaller instead of larger. It would be worth while for one interested to try the experiment of preparing two pieces for shrinking, making the fits as nearly alike as possible, and noting the different effects of heating in the right way and in the wrong way.

I was once deceived in a shrink fit. I had to put a new rod into a piston. The old one, either worn or broken, I have forgotten which, was shrunk on very tightly. I had

to drill a big hole through it before I could force it off. The hole seemed to be in good shape, and I fitted the new rod according to my usual practice, but upon heating the piston I was surprised to find much less than the usual expansion. I think that the iron around the hole had been compressed by the previous shrinkage, and reheating allowed it to resume its original condition.

Heat your work carefully; keep yourself cool. FRANK H. RICHARDS.

Troy, N. Y.

Machine Tools.

Editor American Machinist:

Your correspondent, Oberlin Smith, is on the right track, as shown by his article on the construction of machine tools. Some manufacturers seem to take special pains to make such tools not only as light, but as powerless as possible. "The owl-eyed old wiseacres in spectacles" are really not altogether to blame for taking light cuts, with a fine feed. The lathes are often improperly geared. The pinion on the back shaft and the gear-wheel on the spindle are too nearly of a size. The average head-stock only permits the cone to make eight or nine revolutions to one of the spindle. When a lathe is properly geared and constructed, there is plenty of power for heavy cutting, with a slack belt. Some builders make head-stock patterns up to twelve inches, and after that the same cone, gear-wheel and spindle are used for the larger head-stocks on stilts.

Instead of packing up light, metal-stinted head-stocks in that way, why not make a heavy, triple-geared sliding break, or gap lathe? The ways can be accurately fitted in the bed plate, and used either open or shut. A large face plate, with either an internal wheel or a pinion geared into the outside of the face plate, would give plenty of power. If the lathe is provided with a handy crane, one man can easily take the face plate off and on. A lathe of that description, if provided with a good compound slide rest and stiff tail-stock, would be a very useful tool for a great variety of work.

What your correspondent calls machines constructed on the "fiddle principle" will not be the machines of the future.

How is it that the light, cheap tool-builders have such a mania for architectural ornament, mouldings, ogeeing, etc.? The first-class tool designers make everything as plain as possible, all straight lines ending in tangents or curves. Even the legs are made in that way.

I showed the cut of a well-designed lathe that appeared in the AMERICAN MACHINIST to a "lightning machinist," and he said: "Pooh! Too much Whitworth and John Bull about it. Wont do in this country."

About double-acting planers: I thought it was well known that the swivel tool was the invention of Whitworth. I saw one at work in Fairbairn's shop in Manchester, England, in 1844. VETERAN.

Fort Wayne, Ind.

Quick Speed and Fine Feed vs. Slow Speed and Coarse Feed.

Editor American Machinist:

In your issue of October 7, "Veteran" advocates coarse feed, and tries to convey the impression that the use of fine feed shows poor judgment. I think, perhaps, that "Veteran" might improve his methods by studying up the requirements of good work. Coarse feed may do on rolling-mill and similar work, but coarse feed does not always mean either fast or good work.

"Veteran" says in boring he uses a stiff tool and coarse feed. The stiff tool is right, when circumstances will permit its use, but for boring a long hole the coarse feed is not the thing.

Say you are boring a hole 10″ long; how will you remedy the spring of tool on coarse feed?

I once worked in a shop where considerable boring was done. I run one lathe on such work, and another lathe was run on similar work. I used fine feed and quick speed. My partner (on the other lathe) used coarse feed and slow speed. My lathe got out more work than his, and together we discussed the reason. The result was the conclusion that the coarse feed did not give the tool time to cut, so it sprung away, leaving the hole tapering and doing the work slowly. He changed his plan, increasing his speed and decreasing his feed, and his lathe turned out as much work as mine, and bored a straight hole. He acknowledged that fine feed was the correct thing.

In turning a cylinder head that is to be polished, if the tool is of the right shape and properly ground, there will be no danger of irritating Bodmer with fast speed. Fast speed and fine feed is the only way to satisfactorily do the job.

There isn't any connection between quick speed and tearing around a shop without any purpose. Your slow-feed correspondents seem to take it for granted that there is some sort of connection between quick speed and the half grinding of tools, &c. Let me suggest to them that this is all "in their mind." If a machinist don't grind his tools properly, he won't do good work at any speed. FINE FEED.

Repairing an Engine.

Editor American Machinist:

Is there any accounting for the fact that when a steam engine breaks down every man in the mill finds his way into the engine-room, ready to instruct the engineer how to fix up things? The teamster will tell him how to set the valves, and the mechanical dead-beat will tell him what he don't know about the whole job. There isn't a man around a mill that can't tell an engineer all about running and repairing his engine.

My advice to a young engineer is: if your engine breaks down, don't take advice from any one unless you are sure he knows more about the job than you know. Go to work just as if you owned the mill, and was the only responsible party about the concern. A cool head and common sense will go a good way towards straightening things around a demoralized engine, as well as elsewhere. Sometimes a little makeshift will serve a very useful purpose.

A few years ago I was running a large engine in a mill. We were very busy, running overtime to keep up with orders. One day, quite early in the day, the engine suddenly slackened up. I looked at the steam-gauge; plenty of steam. I looked at the engine for the trouble, and finally, opening one of the cylinder cocks, concluded by the rush of steam that the piston packing was down. I stopped the engine; in five minutes the engine-room was full of men, including the proprietor. With the assistance of the fireman, I removed the cylinder-head and follower and found two springs broken. Perhaps I ought to have had extra springs, but this point wasn't debatable, because the *fact* was I didn't have them.

I handed one of the broken springs to the proprietor, requesting him to have some new ones made. "Hadn't I better send the men home? We can't run to-day," was his response.

I assured him we would run in half an hour, without springs.

I took two blocks of wood and an axe, and soon had the blocks fitted to hold the packing in place, the bolts screwed up, and the engine started. I left the blocks in place till the next Saturday night. CHISEL.

West Bay City, Mich.

A Correction.

Editor American Machinist:

We noticed an article in your valuable paper, copied from London *Ironmonger*, which reads: "The combination of asbestos with india-rubber has been very successful in its application to valves of large size for steam. * * * The advantage of the material is its great durability under steam, and new settings can be readily applied without breaking any joints or removing the body of the valve."

As the above describes the construction of the Jenkins valve so closely, we would like to be allowed to correct the impression as to its novelty, which it would undoubtedly leave on the minds of your readers.

In the Jenkins valve there is used a Jenkins composite disc (or setting, as it is called in the above article), which can be replaced at a very small cost, without disconnecting the body of the valve from the pipe.

As this disc was patented as early as 1868, the idea is not new, and we think a correction of *Ironmonger's* article is not out of order.

JENKINS BROTHERS.

71 John street, New York.

Battery of Boilers.

Editor American Machinist:

Mr. Le Van, in your issue of October 14th, seems to have re-opened the "Battery of Boilers" question, and in his letter says he "has been unable to find authority for the application of the term in any dictionary or text-book."

Now, since languages were made and names invented before dictionaries were printed, it follows that the definitions contained therein are only valuable in proportion to the definer's knowledge of the spoken language. That this value is small in technical matters, is shown in your review of the "Mechanical Dictionary," and in Mr. Durfee's examination of Webster's Unabridged. I, therefore, reject the authority of the books, believing, as I do, that the term "Battery of Boilers" is a good one, and for the following reasons:

First. It is not a newly-coined term, as Mr. Le Van seems to imply in his letter, but is one that has been in use on the Mississippi and its tributaries for many years, meaning two or more cylindrical or flue boilers, which have their mud drums and steam drum in common, and fed with one valve and pipe forming a compound high-pressure boiler, in which the water is assumed to stand at the same level in the different elements. Thus a six-boiler boat will usually have the boilers arranged in two "batteries" of three boilers each.

Second. The derivation of the term, apparently from battery of guns, seems to me to be as reasonable as that of most technical terms. In war the term battery is used to express either the guns or the earth-work in which they are mounted, or the men who work the guns, or the whole thing collectively. In electricity it means a combination of several elementary prime movers of a current. In a quartz mill it means three or five stamps (odd numbers being preferred for luck) working in one mortar, and in the French language, *batterie de cuisine*, means the pots and pans of the kitchen.

For my own part, I am willing to use names as I find them, without inquiring too closely into their derivation. We might raise the questions as to why a shaft-bearing is called a *journal*, or the circular head moving in a cylinder a *piston*, and so lead to interminable discussion. My position, in fact, is that of the professional cricketer in *Punch*, who, being interrogated by a gentleman anxious to get at the reason of things, why a certain peculiar "ball" was called a *yorker*, replies: "A *yorker*, sir—a *yorker!* Why, sir, I don't know what else you could call it."

WM. H. HARRISON.

Braintree, Mass.

Compound Engines.

Editor American Machinist:

If I were to look for the disadvantages of the compound engine, the first thing that I would take into consideration would be the back pressure on the piston of the high-pressure engine. To avoid this back pressure, I have seen stationary engines provided with a receiver, so arranged as to keep the exhaust steam within it at about atmospheric pressure, and supply the low-pressure cylinder as required.

It is strange that Mr. Gleason should have overlooked this point in his reply to my article of September 23d. He is clearly entitled to it.

I did hope that my article was reasonably clear, but if it is not so, it is my mistake.

To show that I have some appreciation of cylinder construction, I refer to an article of mine in the AMERICAN MACHINIST of April 8th, 1882.

In my article of September 23, I said: "It seems likely that less cylinder condensation has something to do with it" (referring to the greater economy of the compound engine).

I left cylinder condensation out of the case to simplify the question of relative expansion, and I left it out in the case of both engines. What can be fairer—the question being expanding alike in each cylinder, and each engine at its best? To get both engines at their best, I took ¼ stroke as the point of cut off, and I took 64 pounds steam pressure, because 64 is so easily divided by 4 and by 16, that the reader can make the division mentally as he reads, and see at once that the compound engine has the advantage of greater expansion.

It is quite immaterial to the question of relative expansion in the two engines, how far expansion may be carried by special means. If applied in this case, both engines would be entitled to the same protection. I said, "I cannot see that it is practicable to get as low terminal pressure in a simple, as in a compound engine. Perhaps I am wrong about it." Now I say, perhaps I am right about it.

My expression "gain by atmospheric pressure" is an error in language, but it is so plain and common an error, that it ought not to confuse any assistant engineer, nor even the ordinary reader. In the same paragraph, I had already used the expression "benefit from use of vacuum," and from his neatly constructed paragraph, I think that Mr. Gleason well knows that logic is sometimes sacrificed to rhetoric.

To simplify the question of relative gain by use of a low terminal pressure, let us leave out of consideration the power required to work the air pump.

Suppose the vacuum to equal 14 pounds, and the steam 14 pounds above atmospheric pressure, the resulting 28 pounds pressure will be just double what it would have been if the 14 pounds of steam had been exhausted into the open air. We would just double our force by use of vacuum, and to double a quantity, is to increase it by 100 per cent. Reduce the terminal pressure to 7 pounds and let it go into a vacuum equal to 14 pounds, and the effect of vacuum will be double that of the 7 pounds of steam if exhausted into the open air. To increase a force by twice its original amount, is to add 200 per cent. to it.

Mr. Gleason must admit that the gain by use of vacuum is tangible. Now, why is not relative gain, expressed by per centage, tangible? I mean just what I say. A low terminal pressure gives a greater proportion of gain from use of vacuum than a high terminal pressure gives.

If Mr. Gleason thinks that percentages of loss and gain are not tangible and of no account, let him reduce his vacuum 50 per cent. and see if he does not find something tangible.

My statement, that "it costs more to keep up low steam than it does to keep up high steam," is simply an argument in favor of high steam. How simple and how strong the argument is, let the reader judge. I am aware that in expanding, steam may lose its temperature, and retain its units of heat in the increased volume; but one thing that I have been trying to show is, that with the compound engine there will be less steam to condense. I do not say that this has been demonstrated, nor that it can be demonstrated; I merely give it as my opinion.

Defiance, Ohio. ANTHON.

Couplings and Clutches.

Editor American Machinist:

The short letter of your Denver correspondent on that double acting planer, has given the clue to the whereabouts of an old school friend. Had lost all trace of him. Anent your editorial on couplings, he used to know something about a coupling and an automatic clutch designed in France, that beat everything for the ease with which it was operated, and the entire absence of danger in its working. NORMAN.

[We should like to hear from our Denver correspondent on the subject here mentioned.]

Coal Report.

Editor American Machinist:

I enclose a blank coal report used in the establishment where I am employed. This blank is filled out every night by the fireman, signed by the engineer and placed on the desk of the superintendent for him to criticise. It is then copied in a book kept for that purpose.

DAILY COAL REPORT.

Date.....
No. of boilers used.....
Name of coal.....
Size.....
From.....
Hours run.....
No. lbs. used.....
Signed .....

I would like to hear through the AMERICAN MACHINIST what plans other engineers have for keeping account of coal they burn through the day. OHIO.

Shop Practice.—A Strong Boring and Turning Mill.

Editor Amer can Machinist:

In my letter on "Shop Practice," of Sept. 16, I inadvertently used the word *feet* instead of *inches*, in speaking of the cutting speed of iron turning tools. The error seems too obvious to need an explanation, still I offer one. The trouble with your correspondent "M.," seems to be that he does not recognize any middle ground between the half lunatic that Chordal describes, and the man who thinks it best to "go slow." I know there is a prevailing notion among machinists that it is best not to hurry, and many stand so straight in this belief that there is a very perceptible leaning backward. This is the result, as I said before, of the education in the shop, and is not to be attributed to any unfriendly or dishonest motive toward employers. Even "Veteran," says: "slow speed is best." But there are many causes for slow machinists. One of the most fruitful is, that in the best shops, as Mr. M., would style them, beginners are, for instance, put to boring wheels for reaping machinery, or turning screws for cider mills, and never learn to do anything else. They tire of this and try other shops, where they find themselves sadly wanting. These men are likely to be strong advocates and representatives of the *go slow* theory and practice. There is never any excuse for slow speeds or slow feeds. I don't like the word "slow." If "slow" is all the work will stand, then it is not slow. Our foreman used to say: "I don't care that *you* should work hard, but make your machine do all it can. Take hold of your hammer handle at the end farthest from the hammer, and when you use a file, try to wear it out from end to end."

I have seldom read an article in which I felt more interest, and approved more heartily, than that of Oberlin Smith in the AMERICAN MACHINIST of Oct. 7th.

"But," says the tool builder, "why make heavier tools when the workmen who use the present ones will not put them up to their full capacity?" This can only be answered by saying: Make the improved tools and educate the young machinist to use them.

It is hard to teach old dogs new tricks. In the matter of making flour, such progress has been made as to make it necessary to educate a new set of millers. Of course, the methods in the machine shop are not likely to be revolutionized to this extent; but in a measure these can, and doubtless will, be revolutionized.

Some twenty years ago I was in want of a large boring mill, capable of turning twelve feet, and with power and rigidity sufficient to take two heavy cuts at once. In search of this, and for other purposes, I canvassed all the tool shops from Worcester, Mass., to Wilmington, Del., searching in vain for the kind of tool I wanted. I returned home intent on making patterns and building such a tool.

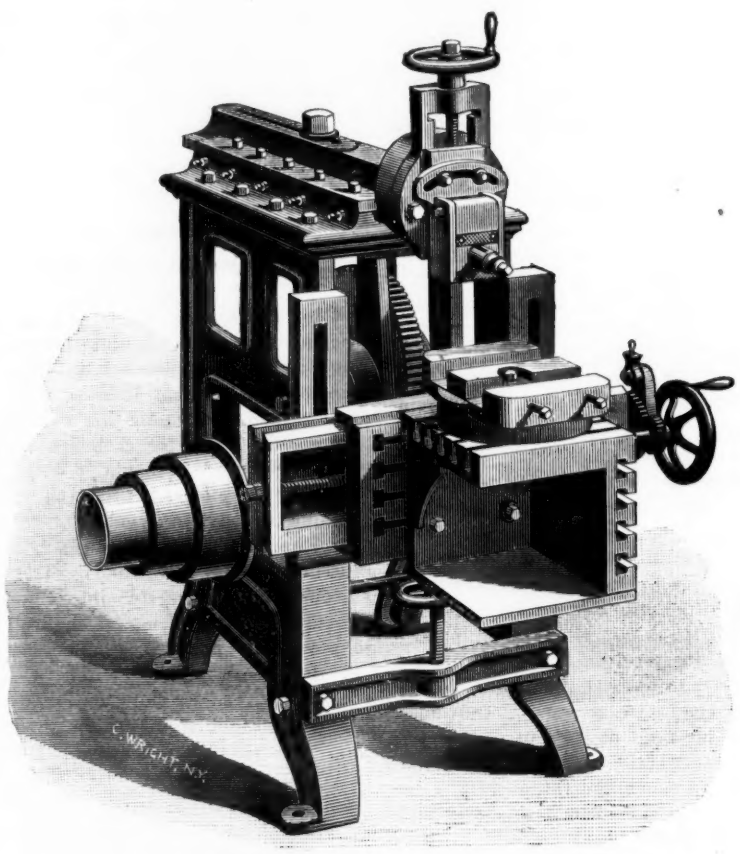
The result was a boring mill on which could be turned a pulley of any diameter up to 12 feet, and any face up to 2½ feet, taking two cuts at the same time, and reducing the diameter where irregularities made it necessary, from ¾ to 1 inch; and this without any perceptible chatter.

The masonry on which this tool stood was 12 feet deep, and as far as proportion went, I think came as near meeting the views of Mr. Smith as anything I ever saw. I kept no account of the amount of iron used, and never knew its weight. Enough to say, it has paid for the surplus iron used in it hundreds of times since it was started.

I employed a device on this tool for adding strength to the saddle, which I have never seen used before nor since. This particular feature was illustrated in the AMERICAN MACHINIST, vol. 4, No. 28, page 6.

In turning or boring at any great distance below the saddle, this device is of incalculable utility, as it is well known that it is next to impossible to make a saddle so strong as to resist the torsion it is subjected to under such circumstances.

By making a connection with the housing beam, as described, the tendency to torsion in the saddle is entirely overcome. Another weak place in such tools usually is the spindle. This I gave a diameter of 16 inches, with a 10-inch internal spindle to be used for boring purposes.



NEW METAL SHAPING MACHINE.

It may not pay tool builders to make such tools, but it surely pays to use them.

DYNAMICUS.

Steel Casks.

A Wolverton firm, says the *Engineer and Iron Trades Advertiser*, have turned their attention to the manufacture of casks and barrels of steel. The two edges of the sheet of steel which form the cask are brazed together in such a manner as to justify the title of "seamless," which the patentees have applied to these productions. The head of the barrel is also riveted to the body, so as to leave no seam, and the end rims are shrunk on hot, thus making a very solid end, whilst, at the same time, the rims are thick enough to give a good purchase to the grappling hooks and cranes for loading and unloading purposes. The bush for the tap does not project beyond the rim, so that the nozzle is not liable to be knocked about and injured. The casks are more durable than wood, less bulky and lighter—an 18-gallon steel cask weighing some 10 lb. less—a not unimportant consideration as regards transit. In point of shape the steel barrel is exactly that of a well-formed wood one, the bulge of the belly allowing of its being easily rolled along and better managed by one man than drums can be by two.

New Metal-Shaping Machine.

We present with this an engraving representing a new metal-shaping machine, recently brought out and now being manufactured by E. W. Bliss, Plymouth, Pearl and John streets, Brooklyn, N. Y. This machine has an extreme stroke of 12½ inches, a lateral feed of 22 inches, with a down feed of 6 inches. It will take in work 15 inches in height above the angle plate, and 12 inches above the chuck.

The lateral slide is fitted with an angle plate, having, in addition to a plane horizontal surface, a plane vertical surface at right angles to the horizontal surface. This angle plate has the usual slots for conveniently attaching work; and, in addition to these, pin-holes drilled and reamed, so that the pins used will accurately fit and be interchangeable. The vertical surface of the angle plate has also a V groove across its surface at right angles and vertically to the horizontal motion of the cutting tool. This slot is found to be of service in holding a round shaft to operate on the end of it, or in planing any piece attached to it, as a piston head on the rod, or any piece permanently attached to its rod, or placed on a mandrel for the purpose. Upon the horizontal surface of the angle iron the chuck is bolted, being set by means of steel pins fitting in quartering holes, so as to bring the jaws either parallel with or at right angles to the stroke of the ram, as may be desirable. The movable jaw of this chuck is adjusted with two set screws, which permits it to swivel to receive and hold angular or tapering pieces. The chuck jaws are faced with steel, the facing pieces being screwed on so as to be readily removed for renewal, or for other purposes. The chuck is quickly removed from the angle iron, when it is advisable to use the surface of the latter for attaching work. The angle iron can similarly be readily removed from the slide, which is long, and adapted to have work clamped to its face. The cross-head, upon which the lateral slide works, is raised or lowered to suit the work being done by means of a screw and a conveniently-located hand-wheel.

The driving motion is by means of a shaft, carrying a moderately small steel pinion which gears into a large cut wheel on a second shaft. This wheel has a slot in its outer surface in which the crank pin is adjustable for the desired stroke, which may be from zero up to 12½ inches. The crank-pin is fitted with a steel thimble, which works in a slotted crank, making the return stroke quickly by working at that time in the part of the slot representing the short end of a lever. This bush works with very little friction, and is easily renewed should it at any time be advisable. The cone pulley on the pinion shaft has three changes for a 3-inch belt, which in connection with the small pinion and large gear gives a strong motion to the ram.

The feed motion gears are brought well outside the frame, by which means the use of a long slide is permissible without reducing the extent of the lateral feed. The feed is readily changed in direction, and from fine to coarse, or *vice versa*, while the machine is in motion.

The ram slides are long, and also the bearing surfaces of the lateral slide, and together with all sliding surfaces are fitted by scraping, and provided with means of adjustment for wear.

The machine as a whole is reasonably compact, but not to an extent to crowd the parts to the detriment of their being conveniently operated, or to reduce to too great an extent its stability.

Holley Memorial Meeting.

We are informed that the joint meeting of the three great engineering societies of the United States, viz.: the Civil, the Mining and the Mechanical, for the purpose of doing united honor to the memory of Alexander Lyman Holley, will be held in New York at the Turf Club Theatre, 26th street and Madison Avenue at 8 o'clock, on Wednesday evening, November 1st, on which occasion Rossiter W. Raymond will deliver the memorial address arranged for by the three societies. As the annual meeting of the American Society of Mechanical Engineers is to occur on the day following, viz., Nov. 2d, members of that body will have special opportunity to be present. There is no industrial or business interest which has not been powerfully benefitted by the results of Holley's labors in establishing the manufacture of Bessemer steel in this country, and the memorial meeting should in the broadest sense represent the sincere sympathy of the industrial and business community.

The Rhode Island Engineers' Association recently did a pleasant thing, in presenting to their popular secretary, Henry D. Cozens, a valuable gold watch chain in appreciation of his efforts in behalf of the society, and of the high esteem in which he is individually held by the members.

The *Australian Trade Review* of Melbourne, Australia, for August 28th, says: "Business, generally, for the month has been dull, but a decidedly better feeling is beginning to be experienced. The hand-to-mouth character of trade, so indicative of dull times, is giving way to more extended transactions and better prices, so that a prospect is opening up of some margin between importers' costs and market rates."

In addition to the delegates to the Engineers' Convention named in our last issue, the following two have been chosen: James G. Beckerley by Chicago Engineers' Association, N. W. Williams, by Keystone Council of Philadelphia, and Charles Hare, Lynn, Mass.

In the description of the Ball steam-engine governor, in the AMERICAN MACHINIST of October 21, the letters *B* and *C* on the governor diagrams (page 2) should be transposed. We also think that the numbers 1 and 2, under the figures on page 3, should be transposed, although this will make no difference whatever in the understanding of the description.

Passaic City, N. J., manufacturers lost from $50,000 to $75,000 by the equinoctial flood. Perhaps some of them will now adopt steam power, and keep away from the floods.

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NEW YORK, OCT. 28, 1882.

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Sinking Funds in Machinery Establishments.

Some railroad companies and other concerns, large and small, maintain sinking funds to apply when the regular receipts are insufficient to meet certain necessary expenditures. This fund is instituted and maintained because their experience has shown that business is subject to wide fluctuations, and that emergencies are apt to arise when previous calculations are entirely upset and ordinary resources prove inadequate.

Sinking funds, accumulated with business active and remunerative, have saved many large corporations from going to the wall, and have carried them safely over periods of depression into permanent prosperity. There is no industry within our knowledge in which the ups and downs of business push harder and longer than in the manufacture of machinery. When orders are crowding for months at a time beyond the capacity of even the largest establishments to fill promptly, it is hard to convince some of the most sanguine that a season of dullness will ever be met. These manufacturers are inclined to use their surplus profits in extending their shops, putting in more machinery, and making ready to meet a further swelling of orders, which is, to a certain extent, good business tact. But the ignoring of such a thing as a possible shrinkage in prices and demand for a prolonged period is not an evidence of sagacious management.

During the depression in general business fron 1873 to 1879, disaster befell many a machinery establishment that had not calculated upon, and consequently had made no provision for forced contraction. The power and support of a sinking fund in the business of making and selling machinery was never more clearly demonstrated than in some of those years when certain establishments ran behind thousands of dollars yet maintained their credit without borrowing, and emerged into prosperous times with a financial strength and reputation that have since been made to pay handsomely. At the present time, when almost any well conducted machinery establishment can lay aside a percentage of profits or a fixed sum every month for a sinking fund, this would seem to be a wise plan to adopt. It cannot be expected that machinery business will continue for many years to be as prosperous as it is now and has been for two years. The advantages of a sinking fund of cash, or of something readily turned into cash without sacrifice, will, some time in the future, be as clearly shown in the machinery business as it has been in the past.

Stationary Engineers Forming a National Society.

In our last week's issue we published a short communication from several delegates to a convention to organize a national society of stationary engineers. All stationary engineers' societies in the United States are requested to send one delegate each to the convention, which is to be held in Pythagoras Hall, 134 Canal street, New York, at 10 A.M., Wednesday, October 25th. Delegates have already been chosen to attend from Philadelphia, Chicago, St. Louis, Brooklyn, Boston, Lynn, Detroit, Providence, Rochester, New York City, and other places. The object is a good one and will doubtless be carried out successfully. The engineers who have charge of fixed steam machinery throughout the country constitute a very large and very responsible body of men.

Not only does the safety of thousands of lives and millions of dollars' worth of property depend upon their care and skill, but they are looked to for the continuous effective operation of the motive power in most factories and shops. When a break down or a disastrous accident occurs, the engineer is usually the first person to receive condemnation, while frequently no blame can justly be placed upon him. To shield others he is often obliged to bear wrongful public accusations.

Added to these adverse conditions, the engineer is frequently—far too frequently—poorly paid and expected to work more hours per week than any other mechanic about the establishment. Again, many individuals pretend to understand the care and management of steam machinery who are not engineers in any sense of the word, yet by offering to work for lower wages than a competent engineer will accept, they obtain situations and bring discredit upon the trade or profession. Of course these parties have no recognized standing among competent and tried engineers, but they may have secured licenses where licenses are required, or otherwise have persuaded employers, who are not well informed on mechanical matters, to engage them. Local engineers' societies exist in many parts of the United States and have been productive of much good; but, scattered as they are, the full force of their efforts is too much divided to accomplish the highest results. What is needed is a national society which will represent the best engineers throughout the country, and whose expressions may be taken by the public as coming from the whole fraternity. This is what we expect to see organized by the convention of Oct. 25th. Boiler construction and setting, boiler appliances, engine economy, and tests and laws for boiler inspection and the licensing of engineers, are among the subjects that may properly engage the attention of the national society. Its united expression of opinion on these and other cognate subjects would doubtless have great weight with the public.

Important Boiler Tests.

Comparative tests of six tubular boilers, each about 40 inches in diameter and 17 feet long, against four Babcock & Wilcox water tube boilers (rated at 75-horse power each) will be made, beginning this week and continuing 96 hours for each set of boilers. These tests will be made to determine the economy and efficiency of all the boilers, including the dynamic value of the steam furnished. The average steam pressure carried will be 100 pounds. The engines through which the dynamic value of the steam is to be tested are of the well known Porter-Allen make. The boilers are located in the Brush Electric Light Company's station at 20th and Johnson streets, Philadelphia. Eight engines and eight dynamos constitute the plant (exclusive of boilers) and every dynamo supplies forty lights of 2,000 candle power each. These tests will be conducted on the part of the Babcock & Wilcox Co. by J. C. Hoadley of Boston and on the part of the Brush Electric Light Company by W. Barnet Le Van of Philadelphia. Calorimeter tests are to be made to determine the humidity of the steam. All the coal and all the water will be carefully weighed. Not only will these tests determine the relative efficiency of the boilers, but also the cost of producing Brush's Electric Light. The results may therefore be looked for with a double interest; and we presume they will be made public as soon as the reports are ready.

Tests of "Controlled Combustion."

Since our last issue, our representative called upon the manager of the Control Combustion Company at his office in this city. During the interview he stated that the stock of the company had all been sold, and that the company were now ready for business, and had a year's work ahead upon their order-book. The first application of their system was to be made upon two boilers in the Equitable Building, 120 Broadway, where the company's offices are located. He informed us that nothing was ready for exhibition at the time of our visit, but that when the boilers are ready for use the system and apparatus may be examined by any one desiring to see it. We should judge that there is about one week's work necessary to complete the boiler setting and apparatus, at the end of which time a demonstration of the true merits of Mr. Mallett's system is promised.

We await with some interest the results of an impartial trial of the best ordinary boiler setting with the system designed by Mr. Mallett, as this course is the only true one to establish the claims of his mechanical appliances.

Improvements in Machine Tools.

Never before in the industrial progress of this country were there so many builders of machine tools as there are now, and never before were so many different designs of tools placed before the mechanical public. Improvements have been, of course; but occasionally there are changes that can hardly be accepted as improvements. The question may be asked: Do lathes, planers, drill presses, shaping machines, and milling machines as now constructed, require further improvements? If so, in what particular? We invite answers to these questions, both from machinists and tool builders. Some of our "Letters from Practical Men" this week discuss certain features of machine tools, and we will be glad to hear from many others. Suitable drawings will be engraved by us to accompany the letters when needed.

Literary Notes.

EXAMPLES OF IRON ROOFS, VOL. I., CONTAINING OUTLINES, DETAILS OF CONNECTIONS AND DIAGRAMS OF STRAINS SIMPLIFIED AND TABULATED FOR THE USE OF ARCHITECTS, ENGINEERS AND STUDENTS. By Thomas Timmins. Published by the author, at 28 Kings Road, London, S. E., England. Size, quarto. Price 12s. 6d., post free.

As iron is ultimately destined to take the place of wood in the construction of buildings and bridges, architects and engineers are turning their attention toward the acquiring of practical information in regard to the strength of iron girders of different styles as well as a calculation of the strains upon each individual member of these trusses. Mr. Timmins, in the book above mentioned, gives in plate 1, forty-two examples of pitched iron roofs, which vary in length from spans of 20 feet to 75 feet. In these examples the principals are placed 6 feet 8″, 8 feet 10″ and 12 feet apart in each. The figures given are intended for a wind pressure of 40 lbs. per square foot of area covered with slate. Each of these plans is figured so that it may be used in practical engineering.

This book contains four large plates measuring 30″ by 22″. Plate 2 contains weights of purlins, safe loads, as well as the weights of wrought iron struts and columns with their details. Plate 3 gives diagrams of strains for principals 12 feet apart. This diagram with data will be found of great practical use to engineers.

Plate 4 consists of diagrams and outlines of trusses giving strains upon each principal, taking the span and load as unity so that the actual load on any member of any truss or any span can be quickly obtained by simple multiplication. This work will prove valuable to that class of practical men who have had neither the time nor opportunity of entering into the theory of strains. A second volume is soon to be issued which will contain "Examples of Curved Roofs."

A SUPPLEMENT TO GRIMSHAW ON SAWS. Containing additional practical matter more especially relating to the forms of saw teeth for special material and conditions, and to the behavior of saws under particular conditions. 120 illustrations, 80 pages. By Robert Grimshaw. Price $2.00. Published by E. Claxton & Co., 930 Market Street, Philadelphia, Pa.

The author in this supplement has endeavored to embody the most desirable information concerning all kinds of new saw blades that have appeared since 1880, which was the date of the original publication. This book contains illustrated descriptions of many of the most important patented devices that have lately been put upon the market. Many useful hints concerning the forms of teeth for general and special purposes, together with practical directions for handling

saws and saw machinery, will be found in this work. It also contains a list of saw patents up to April, 1882.

The illustrated descriptions of tools for setting, gumming, filing and setting saws deserve careful consideration. Circular saws and saw plates are described in detail, giving the advantages in favor of inserted teeth.

A number of engravings of the latest improved circular saw mills form a prominent feature of the book. The engravings are good, the book being well printed and neatly bound. It contains several useful tables of weights, measures, and speeds of belts. One very attractive feature about this book is that it has a good alphabetical index, so that any desired subject contained in the work may be readily found.

MANUAL OF SCREW CUTTING. By William Simpson. Published by S. Woodberry & Co., 105 Summer Street, Boston, Mass. Price $0.25.

This little book contains rules for the change gears of lathes, both simple and compound geared, to cut a thread of any pitch; also how to cut double and treble threads; depth of square threads; how to find the set on a screw cutting tool; the pitch and angle of United States and Whitworth's standard threads, etc. It is specific in its information, treating only of the subjects at issue.

The Mechanic of Smithville, N. J., is a neat 16-page monthly journal which contains considerable valuable reading matter for practical mechanics. Its subscription is only 60 cents a year or $1 for two years. It has been published for several years by the H. B. Smith Machine Co.

Evening Drawing Schools for Mechanics.

Now that the season has arrived for the commencement of evening schools, it would also be well for proprietors to consider the feasibility of having a night drawing school, at least two nights each week, for the benefit of their apprentices and young mechanics who might desire to learn mechanical drawing.

Very few persons engaged in a large manufacturing business fully realize the benefits that would accrue to them by a little outlay in the way of a school of instruction for their workmen. When an individual, especially a mechanic, has arrived at the age of twenty-five years without learning to make drawings, it requires more pluck on his part than is generally supposed, to resolve to buy a box of instruments, drawing board and T square for commencing work.

As a preliminary step he is required to purchase a book on mechanical drawing in which to study the various problems in practical geometry, so this step is neglected time after time, until the idea is given up altogether.

If there were a night school held in connection with the shop, or in the immediate vicinity, one workman would be encouraged by another, so that in a very short time there would be a room full By this time the proprietor will inquire where and how he is to receive any compensation for his outlay. The benefit he would realize would be, first, in the ability of each workman to understand drawings and execute their details without the necessity of a foreman standing over him and losing his patience in the endeavor to infuse into the mind of the workman a true comprehension of the work in hand. If the workmen understood drawing, the time of the foreman could be employed to better advantage in his more important duties. We have known an instance where the workman, in looking over new drawings, discovered serious blunders which necessitated changes in the entire construction of the machine. This discovery was made before any material was finished. Had the workman been ignorant of drawing, this work might have progressed to the damage of several thousand dollars' worth of property, before the errors would have been discovered. The object of these evening drawing schools is not to teach mechanics to draw, under the supposition that they will all become draughtsmen, but rather to interest them in the higher principles of their business, and to awaken a desire to develop their powers of reasoning.

QUESTIONS & ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common sense methods.

(364) R. P., Hartford, Conn., asks: How many machinists and machine shops are there in the United States, according to the last census? *A.*—The details of the last census are not yet all published. This information may eventually appear.

(365) J. W. P., Brainerd, Minn., asks: 1. What is the proper cutting speed in feet per minute for an iron planer? *A.*—From 15 to 20 feet per minute. 2. What should be the speed of the return stroke? *A.*—About 1¼ to 1½ times the speed of the forward stroke.

(366) T. C. D., Granby, Mo., asks; How can I cast copper so it can be worked at a red heat? I have tried several times, but it is brittle. *A.*—Probably you refer to Muntz metal, which is made of 40 parts of zinc and 60 parts of copper.

(367) P. F. S., New Cumberland, Pa., asks: How can I calculate the horse power of a locomotive required to move a train of cars on a railway track; say the weight is 100 tons with a resistance from friction of 800 pounds, the speed to be 25 miles per hour? *A.*—You cannot calculate this with any certainty. It can only be determined experimentally.

(368) J. M. S., Philadelphia, Pa., asks: Will you please tell me of what glass is made? *A.*—Glass is made of silex, and two or more of the following substances, according to the purpose for which the glass is used: magnesia, potash, lime, soda, aluminum, oxide of iron and oxide of lead. Perhaps for some purposes other substances are also used.

(369) C. W. S., Montreal, Canada, asks: 1. When boring and threading a die, should it be bored larger or smaller than standard to give it clearance? *A.*—It is customary to make the hob for cutting adjustable dies a little larger, say for ordinary sizes 1-32″, than the standard tap. 2. Should the tap and hob be turned and cut on one piece, so as to insure the same angle of thread on each? *A.*—This is neither customary nor necessary. If you grind and set your tool properly there will be no trouble.

(370) H. B. T., Geneva, Ohio, asks: 1. Will you please tell me how crude petroleum should be used in a boiler to remove the scale? *A.*—Put from one to two quarts (according to size) into the boiler through the hand hole, safety valve or other convenient opening, when you blow off to clean boiler; or if convenient you can pump it in through the feed pump. Use the boiler exactly as if no oil were present. 2. Will not refined oil do as well as crude oil? *A.*—Refined oil is sometimes used, but the preference is given to the crude oil.

(371) G. G., State Center, Ohio, writes: I have charge of a boiler 10 feet long and 42 inches in diameter. I want to ask: 1. How many potatoes shall I use at a time to remove the scale? *A.*—If you use any, about 4 quarts. 2. How soon after using the potatoes shall I blow off? *A.*—Any time after a week. 3. How many times shall I use the potatoes? *A.*—We do not particularly advise the use of the potatoes at all. There is, however, no objection to your doing so, and we suggest that you use them as long as you are satisfied that they are assisting in removing the scale. You can put them in the boiler as often as you blow off.

(372) Subscriber, Marietta, Ohio, asks: I would like to know what pressure will be required to compress a spiral spring ⅛″, also ¼″, the spring resisting a pressure of 500 pounds; that is, the boiler pressure is 100 pounds and the area of valve 5 square inches? *A.*—It will depend upon how far the spring is compressed to hold the boiler pressure of 100 pounds. Assuming it to be compressed ⅛″, then for each ⅛″ compression it holds 25 pounds, and compressing it ⅛″ further will call for an additional pressure of 25 pounds per square inch on the section of valve, or 125 pounds on the spring. Compressing it ¼″ would double these results, making 50 pounds per square inch on the valve, and 250 pounds on the spring. To put it in the form of a statement in simple proportion: As the present compression of the spring is to the proposed total compression, so is the present pressure to the final pressure. Suppose, as before, that the spring is compressed ⅛″ to hold 500 pounds and you wish to find the pressure when compressed ⅛″ further or ⅛″+⅛″=⅜″ altogether, then, ½ : ⅝ :: 500 : 625, which is the total pressure in pounds on the spring: the pressure per square inch being one-fifth of this, or 125 pounds.

(363) J. R., Detroit, Mich., asks: 1. Will a boiler 30′ diameter stand twice the pressure that one 60″ in diameter will stand? *A.*—Other things being equal, yes. 2. Does the length of a boiler make any difference in the pressure it will stand? *A.*—If properly supported the length need not be considered. 3. Will a boiler stay 12″ long, hold double the strain that one 24″ long will hold? *A.*—If the same in construction and material, the strength will be the same without reference to the length. 4. How do you calculate the tensile strength of a round bar of iron? *A.*—Find the area of the cross section of the bar in square inches, and multiply it by the tensile strength of the material. Thus if you know, or assume, that the material will safely bear a tensile strain of 5,000 pounds per square inch, and wish to know how much a 2″ bar of round iron will hold, first find the area of the two inch bar, which is 3.1416″, and this multiplied by 5,000 equals 15,708 pounds, which is what the 2″ bar will stand with safety. 5. If the weight of a safety valve is 12″ out on the lever, holding a certain pressure in the boiler, will it hold double the pressure if moved out to 24″? *A.*—Not necessarily nor generally. See rule for calculations with reference to safety valves, in the AMERICAN MACHINIST of May 8, 1880. 6. What is the difference between a Corliss engine and any other automatic engine? *A.*—The difference between different automatic engines is in the construction. In different engines the form of the valves, as well as the manner in which they are operated, differs. 7. In setting a boiler should the brickwork touch the shell? I know a boiler upon which rests about two tons of brickwork. *A.*—In setting a boiler the brickwork should not be allowed to come in contact with the shell, and the least weight practicable should be placed upon it.

BUSINESS SPECIALS.

Transient Advertisements, 50 cts. a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Thursday morning for the ensuing week's issue.

F. Samuelson, Pattern Maker, 38 Gold St., N. Y.

James W. See, Consulting Engineer, Hamilton, O.

Steel Name Stamps, &c. J. B. Roney, Lynn, Mass.

Portable Forges, $10. Holt M'f'g Co., Cleveland, O.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N.J.

Pat's mf'd on royalty. A. B. McCool, Pottsville, Pa.

J. M. Badger, Expert and Commission Dealer in Machinery, 5 Dey Street, New York.

Hoerle Bros., Naugatuck, Conn. Small Dies and Special Tools to order.

J. C. Hoadley, Engineer and Expert, 29 High St., cor. Federal, Boston, Mass.

Wood Engraving done in best manner. Designs furnished. Edward Sears, 48 Beekman St. New York.

Howard S. Abbot, Solicitor of Patents, 617 7th St., opposite the Patent Office, Washington, D.C.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

Latest and best books on Steam Engineering. Send stamp for Catalogue. F. Keppy, Bridgeport, Ct.

Foot Power Machinery, for workshop use, sent on trial if desired. W. F. & John Barnes, Rockford, Ill.

Pattern and Brand Letters. Vanderburgh, Wells & Co., corner Fulton and Dutch streets, New York.

"Steam Economy," 124 pp., cloth, $1.00, by mail, points out remedies for defects in engines. Best indicator practice. A. Wilkinson, 123 n. 4th St. Phila.

Pattern Maker's Assistant. By Joshua Rose. 324 pages, $2.50 by mail, postpaid. Address orders, P. O. box 3,306, New York City.

A lot of 25″ lathes designed to equal the best Philadelphia tools, will soon be ready for delivery. Ohl & Co., E. Newark, N. J

Engine Lathes, Speed Lathes, Foot Lathes, Upright Drills, Light Drilling Machines and other fine tools, Frasse & Co., 62 Chatham St., N. Y.

Wanted—To sell a Richards' Indicator in good condition. Address, F. G., BOX 1, AMERICAN MACHINIST.

For Sale.—Steam Engine, extra heavy, in good order, upright, two cylinders, each 12″x20″, heavy fly wheel 7′x2′, Judson governor, bed stone, &c David W. Pond, Worcester, Mass.

The American Standard of Bolts and Nuts, recommended by the Franklin Institute in 1864. Adopted by United States Navy in 1868. Price $1.00. E. Lyman, C. E., New Haven, Conn.

Mechanical Engineering.—To learn inventing, designing and construction of machinery at school. Address, S. W. Robinson, Ohio State University, Columbus, O.

"How to Keep Boilers Clean," and other useful information for steam users and engineers. Book sent free by the publisher, Jas. F. Hotchkiss, 84 John street, New York. Mention this paper.

We will pay 25 cents each for copies of the AMERICAN MACHINIST for January 1, 1881, which are clean and in condition for binding. American Machinist Publishing Co., 96 Fulton street, New York.

Wanted to arrange with the right parties for the manufacture on royalty or otherwise, of a first-class automatic cut-off engine. Address, BOX 10, care AMERICAN MACHINIST, 96 Fulton street, New York.

Russell & Struthers, Wax Process for making outline engravings. Specimens each week in the AMERICAN MACHINIST. We also do Map Engraving with best facilities. Russell & Struthers, 59 Park Place, New York.

"Extracts from Chordal's Letters," the most interesting mechanical book published. A great variety of mechanical and business topics treated in a wise and witty way that will be instructive to old and young mechanics, and interesting to everybody. As many as 150 copies have been sold in a single shop. Over 40 humorous illustrations; 320 pages, 12mo. Price, $1.50 per copy, by mail, to any address. AMERICAN MACHINIST PUBLISHING CO., 96 Fulton St., New York.

Bound Volumes and Patent Binders. We can furnish Volume 3 of the AMERICAN MACHINIST, containing the full 52 issues of 1880, or Volume 4, containing the 53 issues of 1881, neatly bound in cloth, ready to ship by express, for four dollars. Either volume unbound, three dollars. "Patent Binder" for the AMERICAN MACHINIST holds 53 weekly issues in good shape. Sent to any address by mail for one dollar. AMERICAN MACHINIST PUBLISHING CO., 96 Fulton Street, New York.

Rocks, Minerals and Stocks; by Frederick H. Smith, Consulting Engineer and Geologist. Contents: Part I. World Building, Prime Minerals and Rocks, the Formation; Part II. Gold and Silver, Industrial Metals, Coal and Oil, Industrial Minerals, Precious Stones; Part III. Stock Companies, Stock Dealing, Stock Tricks. *A vade mecum* for the use of everyone interested in these important topics. Scientifically accurate, witty, fascinating. *Sui generis* among technical books. Handsomely bound in cloth, $1.50, in paper, 75 cents. Order through your bookseller, or address The Railway Review, 182-184 Dearborn St., Chicago, Ill.

MANUFACTURES.

Waco, Texas, is going to have a new cotton factory.

The Burlington, Iowa, Cultivator Company are erecting a large new factory.

The Smith Foundry Co., New Philadelphia, Ohio, has been incorporated with a capital of $60,000.

The establishment of machine shops at Vicksburg, Miss., will give employment to several hundred mechanics.

W. C. Young & Co., Worcester, Mass., have orders for eighty hand lathes of the kind recently illustrated in the AMERICAN MACHINIST.

An Indiana man will take $3,000 stock in a furniture factory if the citizens of Stanford, Ky., will subscribe $12,000 more towards its establishment.

The American Watch Company, at Waltham, Mass., are now producing 1,000 watches daily. This large production has never before been obtained.

Robert Bishop, Hancock & Edward streets, Philadelphia, has 25 men at work building lathes, planers, printing presses and bolt machinery. Orders are plentiful.

LeRoy, Shattuck & Head, Utica, N. Y., manufacturers of wagon hardware and custom foundry work, are building a foundry 100x56 which makes their foundry building 200 feet long.

The White Mountain Freezer Company of Nashua, N. H., have completed the erection of a foundry building, which will be used for the purpose of manufacturing their own castings.

Work has begun upon the foundation of the new machine shops in Bath, Me., on the site of the old Rice mill property. The buildings are to be sixty feet wide and the dock filled in even with the river front of the wharf.

The Wabash, St. Louis and Pacific Railroad will build, next year, extensive machine and boiler shops at Andrews, Ind., and abandon their works at Fort Wayne. The principal locomotive shops and division headquarters will be at Andrews.

Hill, Clarke & Co. have been awarded the gold medal for the best display of machine tools at the Cincinnati Exposition, also the highest awards (silver medals) for Brainerd Gear Cutter, Hendey Shaper, Hendey Planer and Prentice Upright Drill.

John Thomson, No. 9 Spruce street, New York, the inventor and manufacturer of the parallel bench vise, illustrated in the AMERICAN MACHINIST of April 29, 1882, is meeting with good success in his sales. He recently shipped 6 dozen of these vises on an order from Sydney, Australia.

The Paterson, N. J., shops turned out forty-eight completed locomotives in September; twenty-one from the Rogers, twenty from the Cooke and seven from the Grant Works. The value of forty-eight engines is about three-quarters of a million dollars.

W. F. & John Barnes, Rockford, Ill., manufacturers of tools and of foot and steam power machinery, are erecting a new brick and stone factory 200x40 feet, four stories high, besides engine and foundry buildings. They expect to occupy their new buildings by the latter part of October.

The Parker Electric Manufacturing Company has established a factory south of the depot, at Little Falls, N. Y., for doing light work and experimental operations. Orders amounting to over $60,000 have already been received by the Company. The Remingtons have the contract to manufacture the machines and lamps.

The Baltimore (Md.) Car Wheel Company are now building entire new works, located in another part of the city. The grounds cover an area of ten acres. The machine shop is 100x60 feet, two stories in height, and the foundry 360x60. Two cupolas will be used, and they will have a capacity of 400 car wheels per day.

At Brockton, Mass., Sweetser & Merritt, machinists, are employing their full force of hands in the making of upright drills. They have recently finished eight 22 inch drills, and have orders for a number in smaller sizes. They also carry a good list of machinery used in tack and shoe nail manufacture as well as in the line of boot and shoe machinery.—*Boston Bulletin.*

W. B. Dunning, Geneva, N. Y., has issued a new pamphlet on the Dunning Self-Feeding Boiler, for steam heating, of which over 600 are in use; over 100 being sold in 1882. The pamphlet shows cuts of the boiler explaining every detail, and has a long array of testimonials, and references to parties having the boiler in use. The catalogue will be mailed to any one (with price-list) on application.

F. C. & A. E. Rowland, Engineers, New Haven, Conn., have just put in a pair of their 16″x42″ Improved Greene Engines for the new cartridge manufactory of the Winchester Repeating Arms Co., and have received an order from the same company for a 22″x48″ with 15-ton fly-wheel for their new rolling mill. The Messrs. Rowland are about to make extensive additions to their shop. They propose putting up a building 40x64 feet 3 stories high with an addition 30x 54 feet, one story high for an erecting shop, also a new blacksmith shop and an office building two stories high, 27x35 feet with a drawing room on the second floor. The growing demand for their cut-off engines and their patent vertical engines, machinists' tools and boilers, compels them to provide additional facilities.

Machinists' and Engineers' Supplies.

NEW YORK, Oct. 12, 1882.

During the past ten days trade in the supply market has fallen off to such an extent that the present condition may be described in the language of a dealer as "flat." Prices have weakened, and in several instances have fallen, while intimations from various sources have led both purchasers and dealers to believe that prices would shortly decline.

The Hartford Machine Screw Co., Hartford, Conn., have issued a new reduced price-list.

There has also been a reduction in the prices of Old Colony Rivets.

The Morse Twist Drill Co., New Bedford, Mass., have issued a circular notifying their customers of a contemplated reduction in prices Nov. 1.

C. M. Morse, 132 Nassau street, New York, has taken the agency for Felthousen's Improved Cylinder Oil Pumps, Ratchet Drills, Flue Scrapers and Gauge Cocks, and will put a full supply in stock.

O. L. Packard, Milwaukee, Wis., has added another store to his present business in iron and wood-working machinery and general supplies. The new building is 25x100 feet, three stories high.

Iron and Metal Review.

There is nothing new in the Pig Iron market and the conservative disposition of buyers reported last week continues. Prices are firm.

We quote prices as follows: Foundry, No. 1, $26 to $26.50, for large lots, $28 for small lots; Foundry, No. 2, X, $23.50 to $25. Grey Forge, $20.50 to $21.50. The demand for Foreign Iron remains light but prices continue firm. Buyers are still holding off. We quote prices unchanged as follows: Coltness, $27.50 to $28; Glengarnock, $25.50 to $26; Gartsherrie, $26.25 to $26.50; Summerlee, $26.50; Carnbroe, $24.50; Eglington, $23.50 to $24; Langloan, $26 to $26.50. Wrought Iron Scrap is in moderate demand at $29 to $30 from yard. Iron and Steel Rails quiet with prices unchanged. Old rails quiet but steady at $27 for Tees, and double-heads at $30. Merchant Iron continues moderately active at 2.6 cents card rates.

Copper is dull at 18c. to 18⅛c.; Banca Tin, 28c; Straits, Malacca and Australian 24¾c. to 24⅞c.; Billiton, 25¼c.; English Lamb and Flag, 24¼c to 24½c. Spelter, 5.45c. to 5.55c. for Common Western, Refined, 8c. to 8¾c.; Silesian, 5.40c. to 5.55c. Lead, Common, 5.15c. to 5.20c.; Refined, 5.20c.; Antimony, Hallett's brand 10⅞c. to 11c.; Nevada, 12½c.

WANTED

"Situation and Help" Advertisements, 30 cents for each seven words (one line) each insertion. Copy should be sent to reach us not later than Thursday morning for the ensuing week's issue

A draughtsman experienced in working up details desires situation in machine shop. Address, B., AMERICAN MACHINIST.

A position wanted by a mechanical draughtsman of 10 years' practical and drawing office experience in or around New York. G., 216 Raymond street, Brooklyn, N. Y.

Wanted—A situation by a thoroughly competent engineer and machinist. Will take charge of one or more large automatic cut-off engines. Address, Wm. M. Harrison, Glens Falls, N. Y.

Wanted—Three first-class machinists and one good planer hand, who have worked on machine tools. Must be sober and steady men. None others need apply. Address, Jos. B. Reed, Cairo, Ill.

A man of experience with steam engines and general jobbing, wants a situation to take charge of work. Correspondence solicited. Address, Box 503, Defiance, O.

A good draughtsman, Norwegian, with solid theoretical training and two years practice in German locomotive works, wants a situation. Can show very good certificates. Address, R. B., this office.

A practical mechanic wants a situation as carpenter in a factory. Can draw, make patterns, line shafting, figure on gearing and pulleys and do repairing in general. J. Kohler, 356 E. 4th street, N. Y. City.

Wanted—A situation as Superintendent or Foreman in a shop where steam engines and general machinery are built, by a man of large and varied experience in such work. New York reference. Address, Geo. Shires, 328 W. 30th St., N. Y. City.

Wanted—By a mechanic who has a large machinery correspondence on a line that is in constant demand, some machine shop to manufacture for him. Can give employment to 20 or more men. For particulars address, Thos. Rich, Lock-box 259, Lockport, N. Y.

Wanted—500 feet of 42-inch diameter old boiler shells. Address, P. O. Box 1208, New Haven.

Wanted.—New Compound Duplex Steam Pump. Inventor desires to arrange for manufacture. Address, Duplex Pump, BOX 8, AMERICAN MACHINIST.

Wanted—A horizontal steam boiler, 60 to 80 horse power. Second-hand or new. Address, giving fullest particulars, T. D P., AMERICAN MACHINIST, 96 Fulton street, New York City.

For Sale.—Machine shop and foundry with tools and patterns, having large run of custom work, as well as permanent contract work in foundry, in a town of 10,000 inhabitants in Central Ohio. Nearest shop 20 miles distant. Address, C. C. R., 134 W. 2d St., Cincinnati, O.

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BY SAMUEL NICHOLLS, Foreman Boiler-maker. Embraces full details of Geometry and Orthographic Projection as applied to Boilermaking; also to make, draw, design, and set out all kinds of Templet Work, as Ellipses, Cones, Truncated Cones, Oblique Cones, Frustums of Cones, Chimney Bottoms, Cylinders, Cylinder and Cone, Cylinder and Sphere, Cylinder connected with Curved Tube, Cylinder and Angular Tube, Cylinder with Spiral Staircase, Hip Roof and Cylinder, Tubes, Angular Tubes, T Tubes, Taper Tubes, Curved Tubes, Quadrant Tubes, Downtake Tubes, Flues, Spheres, Domes, etc., of every kind, illustrated with 74 diagrams, including a full solution of all the problems relating to Boilermaking. The Cylinder, its sections, penetration, and development; Welding and Construction, Drilling, Punching, Riveting, Single and Double Riveted Lap and Butt Joints, with Single and Double Strips. Diameter, Spacing, Strength, and Pitch of Rivets; Strength and Pitch of Stays. On Locomotive, Marine, Cylinder, Multitubular, and Egg-ended Boilers; Power of Boilers; Heating Surface of Boiler Tubes in square feet; the Lever Safety Valve; the Cylinder, the Sphere; Area of Fire Grates, Quantity of Steam required for an Engine; Flat Surfaces, Boiler Explosions; Practical Notes on Steam; Properties of Saturated Steam; Proportion of Boilers, Bursting pressure of lap-jointed Wrought Iron Cylindrical Boilers; Collapsing pressure of Wrought Iron Cylindrical Tubes of varying thicknesses. Practical Rules, Instruction, and Memoranda for Boilermakers; Material for Boiler Construction; Weight, Strength, and Dimensions of Wrought Iron Boiler-plates and Iron Bars, Strength of Steel Plates, treatment of do.; Strength of Plates at different temperatures; Strength of Ropes and Chains; Properties of Metals; Weight of Wrought Iron Cylinders per lineal foot of any given diameter and thickness; Angle-Iron Hoops; Diam., Cir., and Areas of Circles, with detailed calculations relating to Boiler Construction; to determine thickness of Boiler-Heads, Cylinder Covers, etc. Mensuration as applied to Boiler-making, Fuel Valves, Combustion of Fuel, Evaporation of Water; Setting Boilers, Incrustation, Boiler Scale Preventives, 35 kinds; Decimal equivalents; Weight of Water; Expansion of Water; Squares, Cubes, and Roots; Fusing Points of Metals; Conducting Powers of Metals; Useful Definitions, Reference Tables (83 pages) for Boiler-makers, Engineers, Smiths, etc. 1 vol. 12mo, extra cloth. Mailed post free to any address on receipt of $2 50. Send for 128 page Illustrated Catalogue of 3000 Standard Books on every subject. *Agents wanted.*
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Steam Pumps for Every Possible Service.
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Hoisting and Lowering are effected by pulling on one or the other side of the rope. As one hook ascends the other descends, and is thus ready for the next load.
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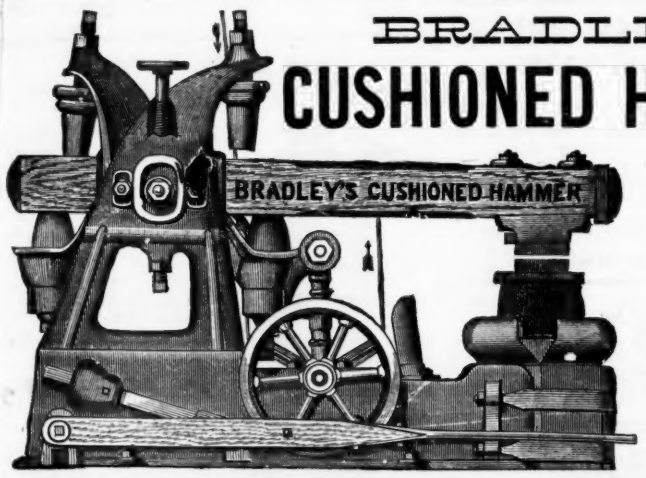

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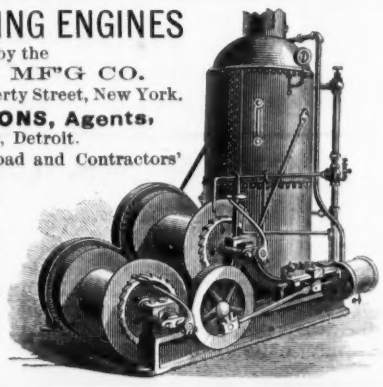

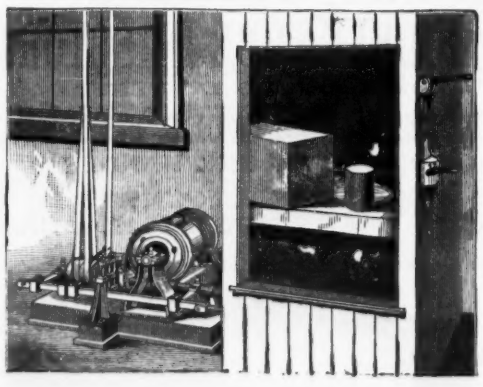
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" 11	1 3-4 "		1.25
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" 13	2 1-4 "		1.60
" 14	2 1-2 "		1.60
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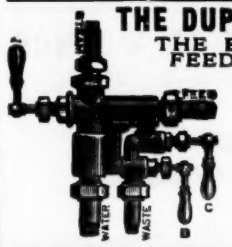

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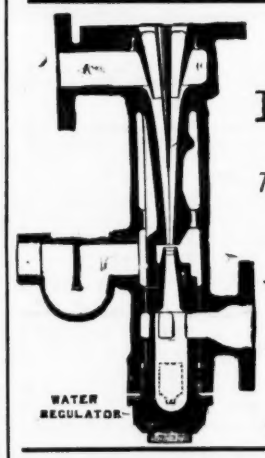

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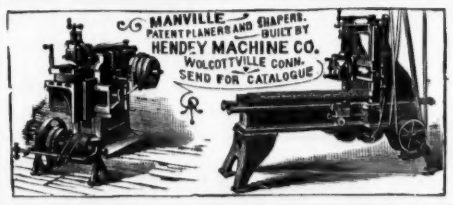

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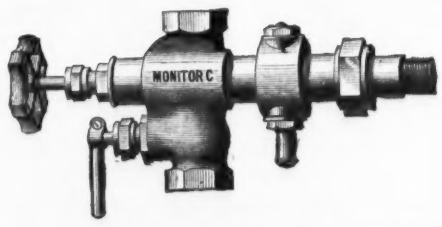

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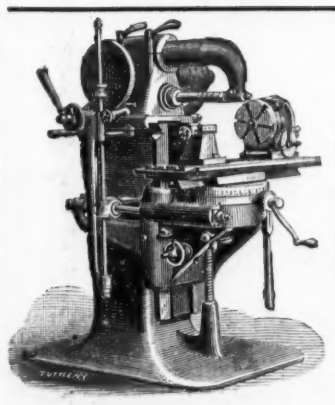
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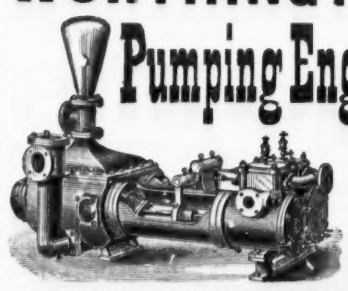
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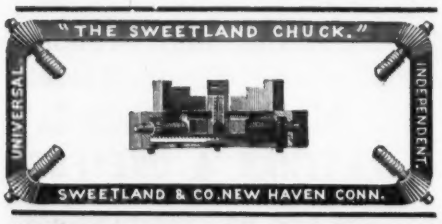

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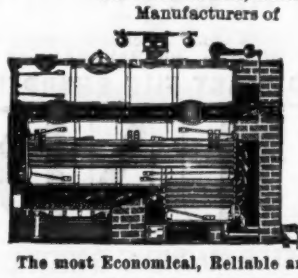

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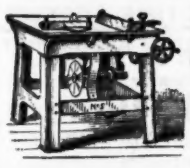

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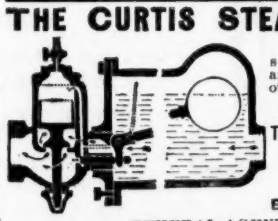

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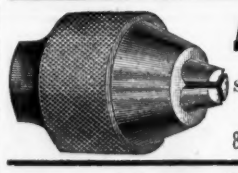

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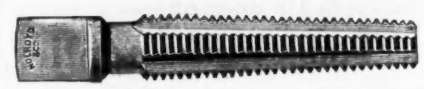

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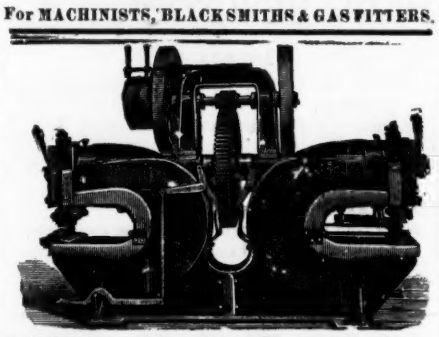

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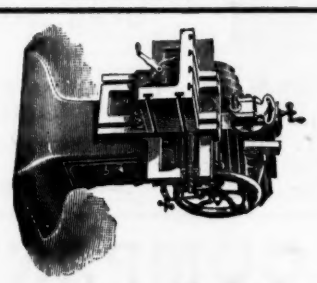

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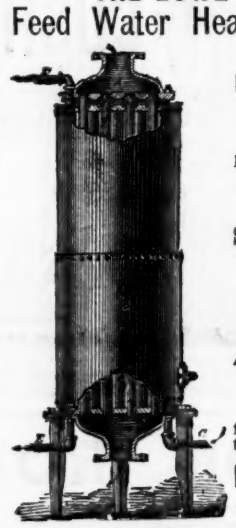

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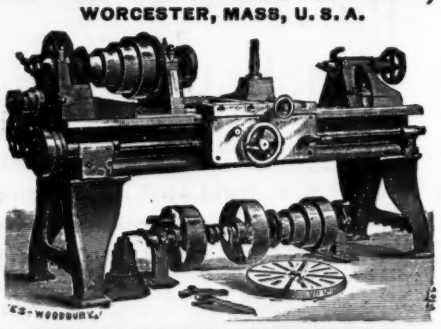

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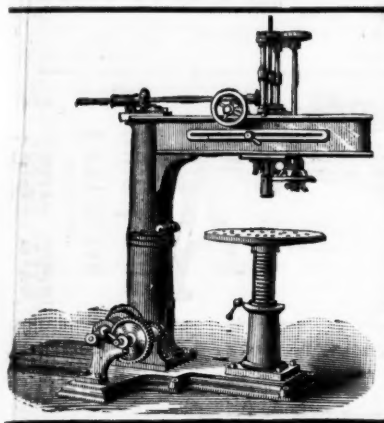

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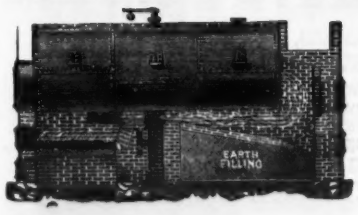

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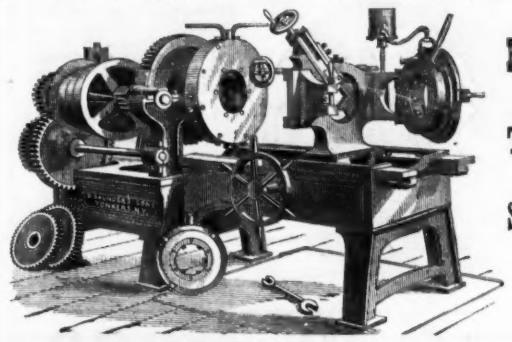

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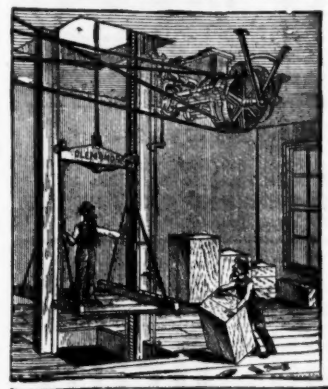

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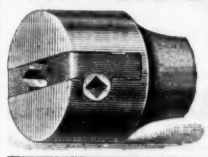

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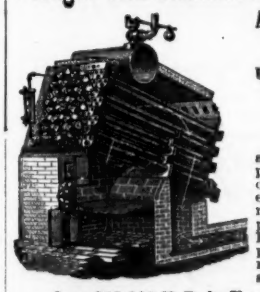

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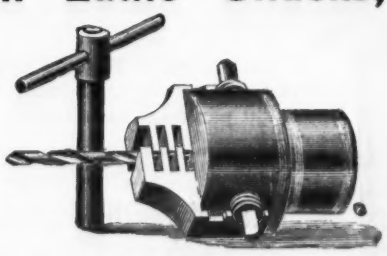

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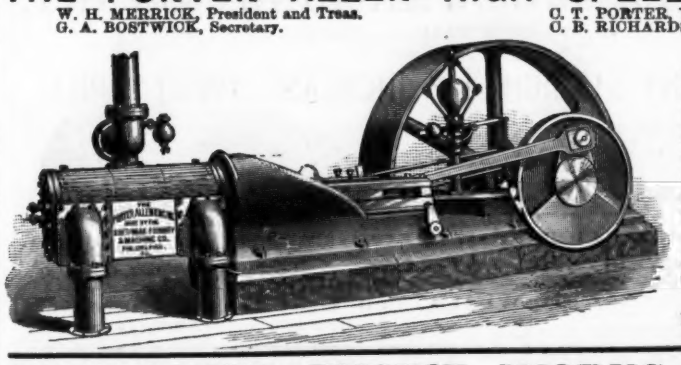

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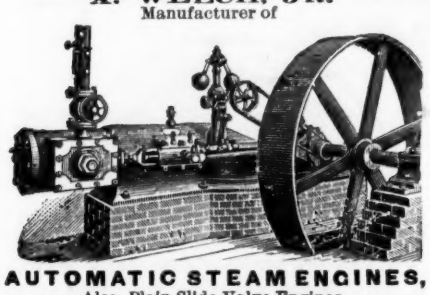

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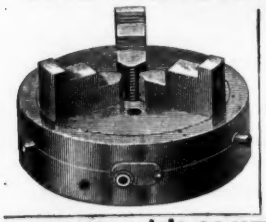

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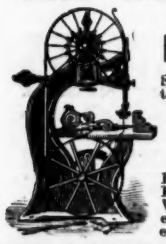

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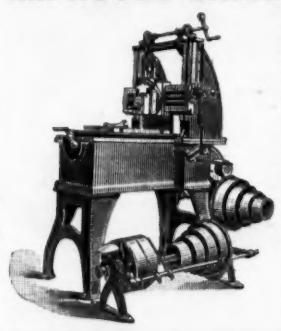

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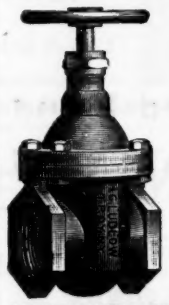

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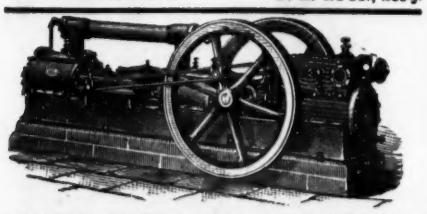

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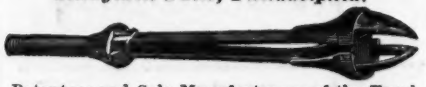

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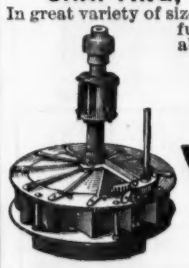

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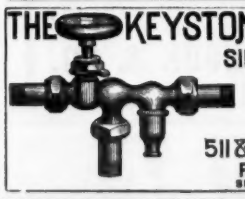

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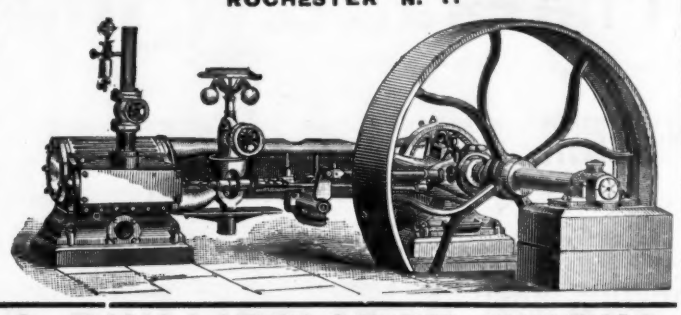

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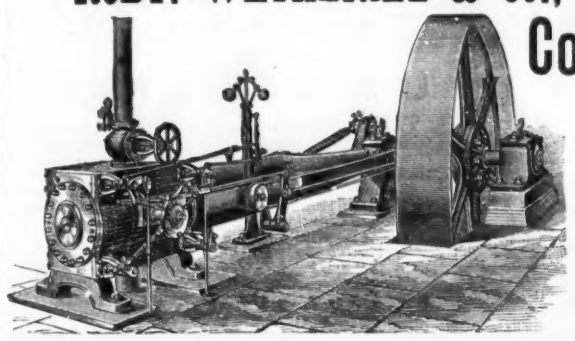

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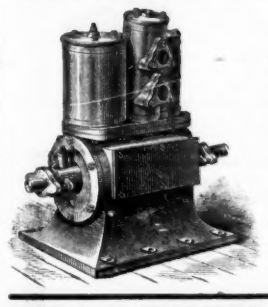

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1	" " 42 in. x 14 ft.	New. [New
1	" " 26 in. x 12 ft.	Grant & Bogert.
1	" " 36 in. x 12, 17 ft.	New.
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1	" " 15 in. x 6 ft.	"
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1	" " 16 in. x 6, 7 & 8 ft.	Bridgeport. "
1	" " 13 in. x 5 ft. & 6 ft.	Ames. "
1	" " 16 in. x6, 7 & 8 ft.	Ames. "
1	" " 18 in.x8 & 10 ft.	Lodge & Barker"
1	" " 24 in. x 12 ft.	Perkins "
1	" " 30 in. x 16 ft.	" "
1	" " 22 in. x 10 ft.	Fifield. New.
1	" " 28 in. x 16 ft.	New. Fifield.
1	" " 11 in. x 4 ft. & 5 ft.	Prentiss.
1	" " 11 in. x 4 ft.	New.
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1	" " " 13 in. x 4 ft.	" " "
1	" " " 15 in. x 4 ft.	New.
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1	15 in. x 4 ft. Turret Lathe.	Lodge & Barker.
1	Planer, 48 in. x 48 in. x 12 ft.	New.
1	" 38 in. x 38 in. x 8 ft.	"
1	" 36 in. x 36 in. x 18 ft.	"
1	" 36 in. x 36 in. x 6 ft.	Good order.
1	" 16 in. x 14 in. x 3½ ft.	New.
1	" 22 in. x 20 in. x 5 ft.	"
1	" 24 in. x 24 in. x 6 ft.	Hendey. new
1	" 26 in. x 26 in. x 7 ft.	"
1	16 in. Upright Drill.	"
1	20 in. Upright Drill.	Prentiss. New.
1	24 in. "	Prentiss. New.
1	30 in. "	" " "
1	25 in. swing B.G. & S. F. Drill.	Blaisdell.
1	28 in. "	" " "
1	15 in. Shaper.	Gould & Eberhart.
1	15 in. Shaper.	Hendey. "
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1	30 in. " 16 ft. "	" " " Oct 20
1	30 in. " 14 ft. "	" " " Oct 10
1	26 in. swing, 14 ft. bed.	Oct. 20th.
1	32 in. x 8 ft.	Planers. New. Oct. 10th.
2	12 in. stroke Slotting Machines.	New. Oct. 10.

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1	New Corliss Engine.	12" x 36". Complete.
1	22 in. swing, 11½ ft.	Bed Engine Lathes. New.
2	22 in. " 12 ft.	" " "
2	18 in. " 8 ft.	" " "
1	17 in. " 10 ft.	" "
5	15 in. " 6 ft.	" " "
1	12 in. swing, 6 ft.	Hand Lathe. New.
1	10 in. " 4½ ft.	Bed Hand Lathe. New.
1	38 in. x 10 ft.	Planer. New.
1	38 in. x 12 ft.	Planer. New.
2	30 in. x 8 ft.	Planers. New.
1	26 in. x 7 ft.	Planer. New.
1	22 in. x 4 ft.	Planer. New.
2	38 in.	Swing Upright Drills. B. G. & S. F. New.
1	26 in.	Drill. B.G.&S.F. New.
1	23 in.	Drill. B. G. & S. F. New.
1	23 in. "	Plain.
3	20 in. "	"
1	18 in.	Bench Drill.
1	4 spindle	Drill. New.
1	3 "	" "
2	4 "	" Second-hand.
1	Wall Drill, heavy.	Second-hand. 60 in
2	12 in.	Shapers. New.
2	15 in. "	"
2	12 in stroke Shapers, traveling head, 40 in traverse double tables.	New.
3	Wood's Patent Bolt Cutting Machines to cut from ½ in to 2 in inclusive.	New.
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2	4½ in Hyde's Patent Centering Machines.	New.
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1	Bolt Pointing Machine.	Second-hand.
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2	Small Power Punching Presses.	Second-hand.
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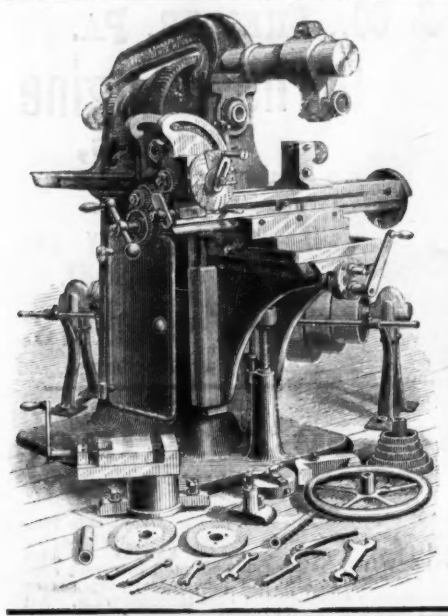
One Special Shafting Lathe, 26 inch swing, 25½ foot bed, to take 20 feet between centers.



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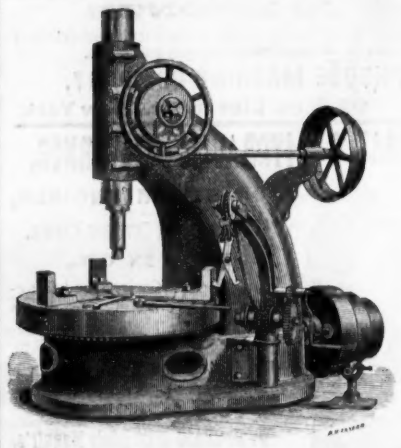

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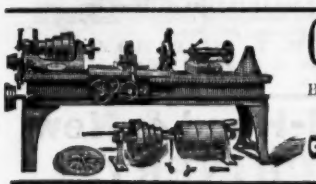

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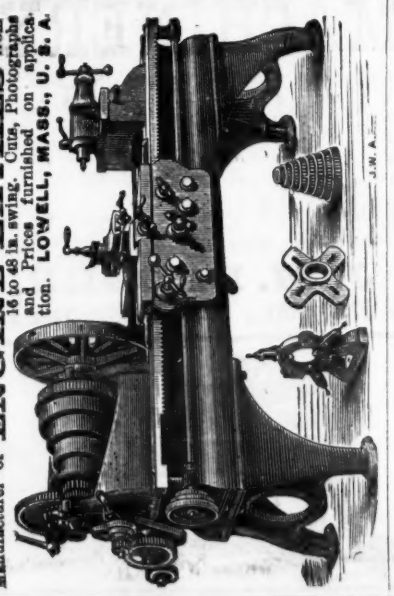

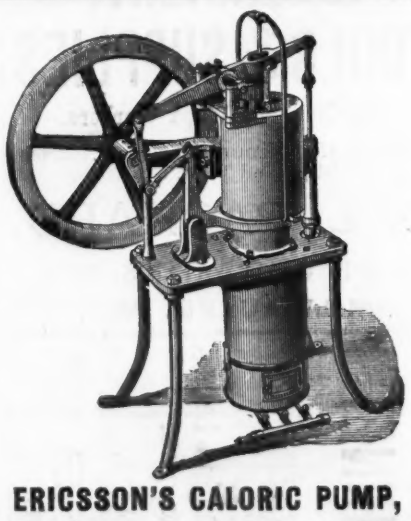

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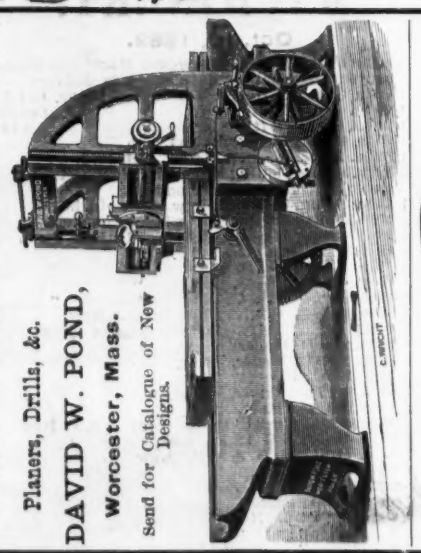

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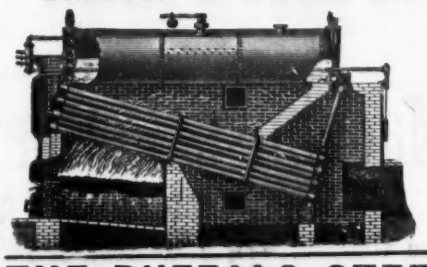

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